W.H. WILLCOX
CHEMISTRY BUILDING
UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN

UNITED STATES ATOMIC ENERGY COMMISSION

Nuclear Science Abstracts

Vol. 6 No. 19
Abstracts 5[illegible]0-5718
Oct. 15, 1952

Technical Information Service, Oak Ridge, Tennessee

UNIVERSITY OF MICHIGAN LIBRARIES

NUCLEAR SCIENCE ABSTRACTS

Nuclear Science Abstracts is issued [illegible] the Atomic Energy Commission. It is intended primarily [illegible] users working within the Atomic Energy [illegible] promptly as possible the literature of nuclear [illegible] the unclassified and declassified research reports [illegible] its contractors, but also material in the field of [illegible] scientific journals and unpublished research reports of [illegible] and industrial research establishments.

INDEXES

Volumes 1, 2, 3, and 4 of Nuclear Science Abstracts [illegible] Author, Subject, and Nuclide in Volume [illegible] No. 24 [illegible] and Nuclide indexes for Volume [illegible] cumulative Numerical index to [illegible] published in Volume 5, No. 24, and [illegible] all reports abstracted in Nuclear Science Abstracts as well as those abstracted in Publication Documents.

Each issue of Volume 5 [illegible] contains an Author Index [illegible] the cumulative Numerical Index of Reports, Subject and Author Indexes [illegible] Quarterly, the Journal will publish separate supplements of the Author, Subject, and Nuclide indexes. The 24th issue will be the Cumulative Index for the year.

AVAILABILITY

Nuclear Science Abstracts [illegible] subscription basis at [illegible] ($15.00) per year domestic and ($20.00) foreign.

[illegible]

Nuclear Science Abstracts is also available [illegible] exchange basis to [illegible] societies, research institutions, industries, [illegible] The Atomic Energy Commission invites [illegible] toward the exchange of publications. Inquiries regarding [illegible] distribution as well as notices of address changes should be directed to:

[illegible]
Technical Information Service
U. S. Atomic Energy Commission
P. O. Box [illegible]
[illegible]

For information on obtaining AEC nonclassified research reports [illegible]

[illegible]

Issuance of these Abstracts does not constitute [illegible] for declassification of any [illegible]

PRINTED IN U.S.
Price 25 Cents

The printing of this publication [illegible]
Director of the Bureau of the Budget

Chemistry Library
QC
770
.U56
V.6
no.19

NUCLEAR SCIENCE ABSTRACTS

Vol. 6, No. 19, October 15, 1952

TABLE OF CONTENTS

Category	Abstract	Page
REPORTS REFERENCE LIST		ii
BIOLOGY AND MEDICINE	5530	677
Radiation Effects	5545	
Radiation Hazards and Protection	5553	
Radiotherapy	5554	
Toxicology Studies	5555	
Tracer Applications	5557	
CHEMISTRY	5560	681
Analytical Procedures	5570	
Crystallography and Crystal Structure	5572	
Fluorine and Fluorine Compounds	5575	
Graphite	5576	
Laboratories and Equipment	5578	
Radiation Chemistry	5580	
Radiation Effects	5581	
Rare Earths and Rare-earth Compounds	5582	
Syntheses	5585	
Transuranic Elements and Compounds	5587	
Uranium and Uranium Compounds	5589	
ENGINEERING	5590	685
Heat Transfer and Fluid Flow	5590	
MINERALOGY, METALLURGY, AND CERAMICS	5596	686
Ceramics and Refractories	5596	
Geology and Mineralogy	5597	
Metals and Metallurgy	5601	
MINERALOGY, METALLURGY, AND CERAMICS		
Tracer Applications	5613	
PHYSICS	5614	689
Cosmic Radiation	5624	
Electrons	5632	
Instruments	5633	
Isotopes	5637	
Isotope Separation	5638	
Measuring Instruments and Techniques	5639	
Mesons	5649	
Meteorology	5656	
Nuclear Physics	5657	
Nuclear Properties	5660	
Nuclear Reactors	5669	
Nuclear Transformation	5670	
Particle Accelerators	5683	
Radiation Absorption and Scattering	5685	
Radiation Effects	5694	
Radioactivity	5695	
Theoretical Physics	5708	
Tritium and Tritium Compounds	5710	
AUTHOR INDEX		INDEX-1
NUMERICAL INDEX OF REPORTS		INDEX-4
NEW NUCLEAR DATA		SUPPLEMENT-1

ERRATA

NSA, Vol. 6, No. 7, p. 261. In abstract 2057, change Roman numeral IV in title to XV.

NSA, Vol. 6, No. 15, p. 534. In abstract 4366, "Sup. 1," should be inserted in reference following volume number.

NSA, Vol. 6, No. 16, p. 599. In abstract 4896, the Greek character xi should be changed to zeta in the title and in the first and eleventh lines. In Reports Reference List, p. vi, in title of NYO-3216 xi should be zeta.

REPORTS REFERENCE LIST

Vol. 6, No. 19

The abstract number for each report is listed at the upper right of the entry. If the number bears an asterisk, the report is title listed only and no abstract is included.

U. S. ATOMIC ENERGY COMMISSION DECLASSIFIED REPORTS

AECD-3432 5710
Los Alamos Scientific Lab.
THE TRIPLE POINT TEMPERATURE OF TRITIUM OXIDE, by W. M. Jones. [nd] Decl. Aug. 19, 1952. 8p. (AECD-3432; LADC-1211)

U. S. ATOMIC ENERGY COMMISSION UNCLASSIFIED REPORTS

AECU-2141 5695
Knolls Atomic Power Lab.
MEASURING LOW-LEVEL RADIOACTIVITY, by David L. Douglas. [nd] 20p. (AECU-2141)

AECU-2144 5601
Stanford Univ. School of Mineral Sciences
INVESTIGATION OF MATERIALS FOR USE IN A HEAT TRANSFER SYSTEM CONTAINING LIQUID LEAD OR BISMUTH, by Edward P. French, Ralph Parkman and O. Cutler Shepard. July 10, 1952. 24p. (AECU-2144; Report No. 13)

AECU-2155 5530
Iowa State Coll.
THE CARBON AND NITROGEN PRECURSORS OF BACTERIAL PURINES, by W. B. Sutton and C. H. Werkman. [nd] 13p. (AECU-2155)

AECU-2162 5531
Sloan-Kettering Inst. for Cancer Research
THE UTILIZATION OF PURINE RIBOTIDES BY LACTOBACILLUS CASEI, by M. Earl Balis, Daniel H. Levin, George Bosworth Brown, Gertrude B. Elion, Henry Vanderwerff and George H. Hitchings. Sloan-Kettering Inst. for Cancer Research and Wellcome Research Labs. 17p. (AECU-2162)

AECU-2165 5545
Brown Univ.
THE ROLE OF THE INTESTINAL FLORA IN RADIATION INJURY; PROGRESS REPORT FOR MAY 1, 1951 TO DECEMBER 31, 1951, by H. B. Chase, P. F. Fenton, M. H. Hatch, W. Montagna and J. W. Wilson. [nd] 6p. (AECU-2165)

AECU-2166 5532
Iowa State Coll.
THIOMETHYLADENOSINE, by F. Schlenk. [nd] 6p. (AECU-2166)

AECU-2167 5533
Iowa State Coll.
THE OCCURRENCE, FORMATION, AND ISOLATION OF THIOMETHYLADENOSINE, by Raymond L. Smith, Edward E. Anderson, Jr., R. N. Overland and F. Schlenk. [nd] 17p. (AECU-2167) (cf. NSA 6-812, 6-1072)

AECU-2168 5570
Argonne National Lab.
ETHYLENEDIAMINE—A CARBONATE-FREE ALKALI FOR CO_2 ABSORPTION, by Robert W. Swick, Donald L. Buchanan and Akira Nakao. June 1952. 2p. (AECU-2168; UAC-588)

AECU-2170 5546
Biological Lab., Cold Spring Harbor
THE ESTIMATION OF ADAPTIVE VALUES OF EXPERIMENTAL POPULATIONS, by Bruce Wallace. Feb. 21, 1952. 21p. (AECU-2170)

AECU-2171 5580
Wisconsin Univ.
EFFECT OF BROMINE CONCENTRATION ON THE PRODUCTS OF THE REACTIONS OF CARBON TETRACHLORIDE WITH BROMINE ACTIVATED BY RADIATIVE NEUTRON CAPTURE AND BY ISOMERIC TRANSITION, by J. F. Hornig and J. E. Willard. [nd] 18p. (AECU-2171)

AECU-2172 5696
Argonne National Lab.
AVERAGE CHARGE OF DAUGHTER ATOMS AFTER β-DECAY, by Sol Wexler. July 1952. 20p. (AECU-2172; UAC-595)

AECU-2173 5697
Argonne National Lab.
AVERAGE CHARGE OF Br^{80} ATOMS FROM ISOMERIC TRANSITION, by Sol Wexler. July 1952. 9p. (AECU-2173; UAC-596)

AECU-2174 5555
Argonne National Lab.
AN INVESTIGATION OF RADIUM DEPOSITION IN THE HUMAN SKELETON BY GROSS AND DETAILED AUTORADIOGRAPHY, by W. B. Looney and Lois A. Woodruff. June 1952. 34p. (AECU-2174; UAC-598)

AECU-2175 5581
Argonne National Lab.
LUMINESCENCE OF ICE AND TRITIATED ICE, by Leonard I. Grossweiner and Max S. Matheson. July 9, 1952. 3p. (AECU-2175; UAC-602)

AECU-2176 5556
Argonne National Lab.
THE TOXICITY OF POLONIUM 210 IN MICE. I. THE 30-DAY LD_{50}, RETENTION, AND DISTRIBUTION, by Miriam P. Finkel, William P. Norris, Walter E. Kisieleski and Gertrude M. Hirsch. June 1952. 24p. (AECU-2176; UAC-609)

AECU-2177 5553
Argonne National Lab.
RADIATION DOSE REDUCTION BY CYSTEINE, by H. M. Patt, S. H. Mayer, R. L. Straube and E. M. Jackson. July 1952. 24p. (AECU-2177; UAC-610)

AECU-2178 5578
Argonne National Lab.
RADIOACTIVE COBALT LABORATORY FOR CHEMICAL RESEARCH, by Roland A. Blomgren, Edwin J. Hart and Leon S. Markheim. July 17, 1952. 21p. (AECU-2178; UAC-611)

AECU-2179 5534
Argonne National Lab.
DESCRIPTION OF TECHNIQUE FOR ULTRA-THIN SECTIONING FOR ELECTRON MICROSCOPY, by Barbara W. Massey. July 1952. 12p. (AECU-2179; UAC-612)

AECU-2180 5590
Illinois Inst. of Tech.
PRESSURE DROP IN TWO PHASE FLOW (thesis), by David Howard Weiss. June 1952. 77p. (AECU-2180; UAC-613)

AECU-2181 5591
Ohio State Univ.
A NEW-TYPE HEAT INTERCHANGER FOR LARGE LIQUEFIERS, by J. Nicol, T. S. Smith, C. V. Heer and J. G. Daunt. [nd] 17p. (AECU-2181)

AECU-2182 5614
Ohio State Univ.
SUPERCONDUCTIVITY OF RHENIUM, by J. G. Daunt and T. S. Smith. [nd] 19p. (AECU-2182)

AECU-2183 5557
California Univ., Davis. Dept. of Animal Husbandry
THE METABOLIC FECAL NITROGEN EXCRETION OF THE YOUNG CALF AND THE TRUE DIGESTIBILITY OF CASEIN, by G. P. Lofgreen and Max Kleiber. [nd] 16p. (AECU-2183)

AECU-2184 5558
California Univ., Citrus Experiment Station, Riverside
TRANSLOCATION OF RADIOACTIVE OCTAMETHYL PYROPHOSPHORAMIDE IN BLACK VALENTINE BEAN PLANTS, by Randolph T. Wedding and Robert L. Metcalf. [nd] 20p. (AECU-2184)

AECU-2185 5559
Pennsylvania Univ. School of Medicine
THE RELATION OF α-METHYLBUTYRATE TO ISOLEUCINE METABOLISM. II. PROPIONATE FORMATION, by Minor J. Coon, Norman S. B. Abrahamsen, and Grace S. Greene. [nd] 24p. (AECU-2185)

AECU-2186 5560
Illinois Univ.
TEMPERATURE COEFFICIENT OF THE INTERMOLECULAR CARBON ISOTOPE EFFECT IN DECARBOXYLATION OF NORMAL MALONIC ACID, by Peter E. Yankwich, R. L. Belford and Gideon Fraenkel. [nd] 16p. (AECU-2186)

AECU-2187 5547
Chicago Univ.
THE GRAM-NEGATIVE FLORA OF THE UPPER INTESTINAL TRACT AND ITS INFLUENCE ON POST-IRRADIATION BACTEREMIA IN MICE, by C. Phillip Miller, Marianne Tompkins, Margaret Colling, Marjorie Bohnhoff and Carolyn W. Hammond. [nd] 7p. (AECU-2187)

AECU-2188 5561
Washington Univ., St. Louis
THE REACTIONS OF ARYL ESTERS OF PHOSPHOROUS ACID WITH IODINE (thesis), by James P. Forsman and David Lipkin. [nd] 23p. (AECU-2188)

AECU-2189 5535
Institute for Atomic Research, Iowa State Coll.
METABOLISM OF SOYBEAN LEAVES. V. THE DARK REACTIONS FOLLOWING PHOTOSYNTHESIS, by D. W. Racusen and S. Aronoff. [nd] 31p. (AECU-2189)

AECU-2190 5536
Pennsylvania Univ. School of Medicine
BACTERIA AS CELLS AND AS ORGANISMS. SECTION ON NUCLEI AND CHROMOSOMES, by Edward D. DeLamater. [nd] 28p. (AECU-2190)

AECU-2191 5585
California Univ., Berkeley. Coll. of Agriculture
PREPARATION OF MALTOSE LABELED WITH C^{14} IN THE REDUCING OR NONREDUCING GLUCOSE COMPONENT, by Charlotte Fitting, E. W. Putman and W. Z. Hassid. [nd] 9p. (AECU-2191)

AECU-2192 5537
Pennsylvania Univ. School of Medicine
ASPECTS OF BACTERIA AS CELLS AND AS ORGANISMS, by Stuart Mudd and Edward D. DeLamater. [nd] 33p. (AECU-2192)

AECU-2193 5660
Wisconsin Univ.
EVIDENCE FOR NON-ADDITIVITY OF NUCLEON MOMENTS IN HEAVY NUCLEI, by Marc Ross. [nd] 32p. (AECU-2193)

AECU-2195 5548
Chicago Univ.
DURATION OF POST-IRRADIATION BACTEREMIA IN MICE, by Carolyn W. Hammond, C. Phillip Miller, Marianne Tompkins, Margaret Colling and Marjorie Bohnhoff. [nd] 8p. (AECU-2195)

AECU-2196 5694
Brookhaven National Lab.
RADIATION EFFECTS IN SOLIDS, by G. J. Dienes. Apr. 1, 1952. 62p. (AECU-2196)

AECU-2198 5633
Argonne National Lab.
THE THEORY OF MECHANICAL ELECTROMETERS, by Raymond J. Munick. July 1952. 18p. (AECU-2198; UAC-600)

AECU-2199 5570
Knolls Atomic Power Lab.
THERMAL CONDUCTIVITY, ELECTRICAL RESISTIVITY AND THERMOELECTRIC POWER OF GRAPHITE, by W. W. Tyler and A. C. Wilson, Jr. June 30, 1952. 21p. (AECU-2199)

AECU-2200 5634
Knolls Atomic Power Lab.
A SPIRAL-SCANNING X-RAY REFLECTION GONIOMETER FOR THE RAPID DETERMINATION OF PREFERRED ORIENTATIONS, by A. N. Holden. [nd] 9p. (AECU-2200)

AECU-2201 5602
Institute of Engineering Research, Univ. of Calif., Berkeley
FINAL REPORT [ON] METALLURGICAL INVESTIGATION OF MATERIALS SUBJECTED TO LIQUID LEAD-BISMUTH ALLOY ENVIRONMENT, by R. C. Grassi, D. W. Bainbridge, and J. W. Harman. July 31, 1952. 78p. (AECU-2201)

ANL-4828 5639
Argonne National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY REPORT FOR MARCH, APRIL AND MAY, 1952. [nd] 21p. (ANL-4828)

ANL-4845 5562
Argonne National Lab.
ELECTROLYTIC REDUCTION OF PERRHENATE. I. STUDIES IN PERCHLORIC, ETHANESULFONIC, TRIFLUORACETIC AND HYDROCHLORIC ACIDS, by J. C. Hindman and Philip Wehner. May 1952. 12p. (ANL-4845; AECU-2112; UAC-577)

ANL-4846 5563
Argonne National Lab.
ELECTROLYTIC REDUCTION OF PERRHENATE. II. STUDIES IN SULFURIC ACID, by Philip Wehner and J. C. Hindman. May 1952. 13p. (ANL-4846; AECU-2110; UAC-579)

BNL-167 5640
Brookhaven National Lab.
THE AREA SURVEY MANUAL OF BROOKHAVEN NATIONAL LABORATORY; AREA RADIATION DETECTION INSTRUMENTATION, MAINTENANCE, AND RESULTS, by Max M. Weiss. Jan. 1, 1952. 151p. (BNL-167)

BP-42(3rd Ed.) 5683
Crocker Lab., Univ. of Calif., Berkeley
THE RADIO-FREQUENCY SYSTEM OF THE 60-INCH CYCLOTRON AT BERKELEY, by Kenneth E. Relf. 1950. 240p. (BP-42(3rd Ed.))

COO-94 5605
Metallurgical Labs., Dow Chemical Co.
10TH QUARTERLY REPORT [FOR] MARCH 1, 1952 - MAY 31, 1952 [ON] PREPARATION OF HIGH PURITY MAGNESIUM AND A STUDY OF THE EFFECT OF NON-METALLIC AND ALKALI METAL IMPURITIES ON THE CORROSION CHARACTERISTICS OF PURE MAGNESIUM. [nd] 31p. (COO-94)

CU-110 5657
Nuclear Physics Labs., Columbia Univ.
PROGRESS REPORT FOR JANUARY, FEBRUARY, MARCH 1952. June 6, 1952. 40p. (CU-110)

JPL-PR-1-79 5592
Jet Propulsion Lab., Calif. Inst. of Calif.
PROGRESS REPORT [ON] A STUDY OF THE MECHANICS OF LIQUID FILMS AS APPLIED TO FILM COOLING, by Eldon L. Knuth. Nov. 21, 1951. 16p. (JPL-PR-1-79; U22349)

KLX-1378 5579
Vitro Corp. of America
QUARTERLY PROGRESS REPORT [FOR] APRIL-JUNE, 1952 [ON] DEVELOPMENT OF LABORATORY WASTE DISPOSAL UNIT. July 26. 1952. 7p. (KLX-1378)

LA-1416 5593
Los Alamos Scientific Lab.
HEAT EXCHANGE BETWEEN A COPPER SURFACE AND LIQUID HYDROGEN AND NITROGEN, by Robert N. Mulford and Joseph P. Nigon. May 21, 1952. 7p. (LA-1416)

NYO-3172 5598
Lamont Geological Observatory, Columbia Univ.
U-Pb METHOD OF AGE DETERMINATION; FIRST ANNUAL REPORT AND PROJECT EXTENSION PROPOSAL, by J. Laurence Kulp. Apr. 1, 1952. 35p. (NYO-3172)

NYO-3203 5670
Rochester Univ.
THE BORN APPROXIMATION THEORY OF d-p AND d-n REACTIONS, by P. B. Daitch and J. B. French. July 9, 1952. 7p. (NYO-3203)

NYO-3218 5686
Rochester Univ.
INTERFERENCE BETWEEN COULOMB AND NUCLEAR SCATTERING IN p-p COLLISIONS AT 240 MEV, by H. P. Noyes and H. G. Camnitz. July 17, 1952. 6p. (NYO-3218)

NYO-3219 5661
Rochester Univ.
ANGULAR DISTRIBUTIONS OF PROTONS AND TRITONS FROM DEUTERON INDUCED REACTIONS ON Be^9, by H. W. Fulbright, J. A. Bruner, D. A. Bromley, and L. M. Goldman. July 25, 1952. 11p. (NYO-3219)

NYO-3220 5649
Rochester Univ.
MESON-NUCLEON SCATTERING AND THE CLASSICAL STRONG-COUPLING THEORY, by David Feldman. Aug. 1, 1952. 9p. (NYO-3220)

NYO-3222 5650
Rochester Univ.
X-RAYS FROM MESIC ATOMS, by M. Camac, A. D. McGuire, J. B. Platt and H. J. Schulte. Aug. 14, 1952. 6p. (NYO-3222)

ORNL-1340 5669
Oak Ridge National Lab.
A DETERMINATION OF THE DIFFUSION LENGTH OF THERMAL NEUTRONS IN THE X-10 STANDARD GRAPHITE PILE, by E. D. Klema, R. H. Ritchie and T. Arnette. Issued Aug. 15, 1952. 9p. (ORNL-1340; AECD-3384)

RM-653(pt.II) (RAND) 5662
RAND Corp.
GAMMA-RAY TRANSMISSION THROUGH FINITE SLABS - PART II, by G. H. Peebles. May 2, 1952. 185p. (RM-653 (pt.II) (RAND))

SO-2506 5610
General Electric Research Lab.
DEVELOPMENT OF ZIRCONIUM BASE ALLOYS; ELEVENTH QUARTERLY REPORT (PROGRESS REPORT NUMBER 12), by J. H. Keeler. July 5, 1952. 30p. (SO-2506; Progress Report No. 12; RL-714)

UCLA-215 5539
Atomic Energy Project, Univ. of Calif., Los Angeles
EFFECT OF SOME PREADMINISTERED DRUGS ON LUNG EDEMA PRODUCED BY BLAST INJURY, by B. Cassen, K. Kistler, and W. Mankiewicz. Issued Aug. 6, 1952. 14p. (UCLA-215)

UCLA-216 5552
Atomic Energy Project, Univ. of Calif., Los Angeles
FURTHER STUDIES ON THE MECHANISM OF PULMONARY CLEARANCE OF PRODIGIOSIN IN NORMAL AND X-IRRADIATED RABBITS, by George V. Taplin, James S. Grevior, Camille Finnegan, Arthur Dunn, and Philip Noyes. Issued Aug. 12, 1952. 17p. (UCLA-216)

UCLA-217 5540
Atomic Energy Project, Univ. of Calif., Los Angeles
METABOLISM AND URINARY EXCRETION OF SEVERAL FLAVONOID COMPOUNDS, by Thomas J. Haley and Murray Bassin. Issued Aug. 15, 1952. 8p. (UCLA-217)

UCRL-1895 5636
Radiation Lab., Univ. of Calif., Berkeley
DESIGN OF A TRIGGERED GAP, by Leonard E. Gibson and Mark Harris, II. July 15, 1952. 21p. (UCRL-1895)

UR-213 5541
Atomic Energy Project, Univ. of Rochester
QUARTERLY TECHNICAL REPORT [FOR] APRIL 1, 1952 THRU JUNE 30, 1952, by Henry A. Blair. July 31, 1952. 71p. (UR-213)

UR-214 5542
Atomic Energy Project, Univ. of Rochester
THE RELATIONSHIP OF THE CELL SURFACE TO METABOLISM. VIII. THE STIMULATION OF FERMENTATION BY EXTRACELLULAR POTASSIUM, by Aser Rothstein and Cenza Demis. July 1952. 24p. (UR-214)

UR-215 5543
Atomic Energy Project, Univ. of Rochester
CALCIUM COMPLEXES OF ATP AND ADP AND THEIR SIGNIFICANCE IN CALCIFICATION IN VITRO, by Victor DiStefano and W. F. Neuman. Aug. 12, 1952. 10p. (UR-215)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AERE CE/R-912 5613
Atomic Energy Research Establishment, Harwell, Berks (England)
RADIOACTIVE ISOTOPES IN MINERAL DRESSING RESEARCH, by J. S. Carr. May 1, 1952. 30p. (AERE CE/R-912)

AERE-CE/R-913 5615
Atomic Energy Research Establishment, Harwell, Berks (England)
A STUDY OF THE MOTION OF SOLID PARTICLES IN A HYDRAULIC CYCLONE, by D. F. Kelsall. Apr. 21, 1952. 34p. (AERE-CE/R-913)

AERE Inf/Bib-86 5587
Atomic Energy Research Establishment, Harwell, Berks (England)
BIBLIOGRAPHY ON AMERICIUM. Apr. 1952. 6p. (AERE Inf/Bib-86)

AERE-N/R-902 5698
Atomic Energy Research Establishment, Harwell, Berks (England)
THE INVESTIGATION OF SOFT RADIATIONS FROM Pu^{239} AND U^{233} WITH A PROPORTIONAL COUNTER, by D. West, J. K. Dawson, and C. J. Mandleberg. Apr. 28, 1952. 20p. (AERE-N/R-902)

AF-TR-6595(pt.1) 5603
Massachusetts Inst. of Tech.
STUDIES AND EXPERIMENTAL INVESTIGATIONS FOR THE DEVELOPMENT OF PHASE DIAGRAMS OF THE TITANIUM-CHROMIUM AND TITANIUM-COPPER ALLOY SYSTEMS, by Frank B. Cuff, Jr., Arnold S. Joukainen, Lee S. Richardson, and John C. Nicholls. Nov. 1951. 65p. (AF-TR-6595(pt.1))

AF-TR-6597(pt.2) 5604
Notre Dame Univ.
THE TITANIUM-IRON PHASE DIAGRAM, by W. J. Fretague, C. S. Barker and E. A. Peretti. Mar. 1952. 47p. (AF-TR-6597(pt.2))

BM-RI-4870 5564
Bureau of Mines
SOME THERMODYNAMIC VALUES FOR FERROUS OXIDE, by G. L. Humphrey, E. G. King, and K. K. Kelley. June, 1952. 19p. (BM-RI-4870)

G-119 5597
Bureau of Reclamation, Dept. of the Interior
GEOPHYSICAL INVESTIGATIONS FOR UNITED STATES ATOMIC ENERGY COMMISSION IN THE COLORADO PLATEAU AREA, by Dart Wantland. July 25, 1952. 148p. (G-119)

NBS-1003 5685
National Bureau of Standards
X RAY ATTENUATION COEFFICIENTS FROM 10 KEV TO 100 MEV, by Gladys R. White. May 13, 1952. 104p. (NBS-1003; U22744)

NBS-1707 5635
National Bureau of Standards
DAMPING OF ELASTICALLY SUPPORTED ELEMENT IN A VACUUM TUBE, by Samuel Levy, Edward V. Hobbs, Wilhelmina D. Kroll and Leonard Mordfin. June 1952. 15p. (NBS-1707)

NP-3731 5538
Naval Medical Research Inst., Bethesda
THE URINARY EXCRETION OF GALLIUM, by J. I. Munn and H. C. Dudley. Dec. 17, 1951. 20p. (NP-3731; R6279)

NP-3796 5549
Naval Medical Research Inst., Bethesda
RADIOLOGY AND RADIOACTIVITY EFFECTS OF WHOLE BODY IRRADIATION, by E. P. Cronkite and George Brecher Nov. 15, 1951. 25p. (NP-3796; Lecture and Review Series 51-11; R6317)

NP-3953 5624
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
THE HARD COMPONENT OF COSMIC RAYS IN THE UPPER ATMOSPHERE, by Malcolm A. Clark. June 1, 1952. 101p. (NP-3953; Technical Report No. 59; U22726)

NP-3956 5565
Tour, Sam and Co., Inc.
FINAL TECHNICAL REPORT; NITRIDING AND CARBONITRIDING OF TITANIUM METAL AND ITS ALLOYS, by Edmond J. Silk. May 12, 1952. 38p. (NP-3956; WAL Report 401/49-9; U22748)

NP-3960 5566
University of Southern Calif.
STUDY OF THE PROPERTIES OF MICELLES; FIRST TECHNICAL REPORT [ON] NEW METHOD OF DETERMINING DIFFUSION COEFFICIENTS, by Karol J. Mysels and Dirk Stigter. June 1952. 60p. (NP-3960; U22707)

NP-3969 5596
New Jersey Ceramic Research Station, Rutgers Univ.
TECHNICAL REPORT NO. 3; A TECHNIQUE FOR MAKING MOLYBDENUM CRUCIBLES FOR CERAMIC RESEARCH. June 15, 1952. 8p. (NP-3969; Technical Report No. 3; U22749)

NP-3973 5606
Armour Research Foundation
RESEARCH AND DEVELOPMENT TOWARD IMPROVING TITANIUM-ALUMINUM BINARY ALLOYS BY THE ADDITION OF A THIRD COMPONENT; INTERIM TECHNICAL REPORT NO. 2 FOR JANUARY 1–APRIL 30, 1952. [nd] 35p. (NP-3973)

NP-3981 5607
Massachusetts Inst. of Tech.
THE CONSTITUTION OF TITANIUM-TANTALUM-CARBON ALLOYS; TECHNICAL REPORT NO. 4, by John G. McMullin. June 10, 1952. 47p. (NP-3981; Technical Report No. 4; U22922)

NP-3990 5608
Fansteel Metallurgical Corp.
INTERIM TECHNICAL PROGRESS REPORT [ON] DEVELOPMENT OF A PROTECTIVE COATING FOR TITANIUM ALLOYS FOR PERIOD FEBRUARY 29, 1952 THRU JUNE 30, 1952, by Stanley Kluz, Caesar Kalinowski, and Ralph Wehrmann. [nd] 5p. (NP-3990; Report 401/51-11)

NP-3997 5609
New York Univ.
THE QUENCH HARDENING OF TITANIUM-MANGANESE ALLOYS, by Y. C. Liu. Jan. 25, 1952. 26p. (NP-3997; WAL-401/88-6; Interim Technical Report No. 1)

NP-3999 5567
Cryogenic Lab., Ohio State Univ.
VAPOR PRESSURES OF INORGANIC SUBSTANCES. IX. TITANIUM BETWEEN 1587° AND 1764° K, AND COPPER BETWEEN 1143° AND 1292° K; TECHNICAL REPORT, by James W. Edwards, Herrick L. Johnston, and Walter E. Ditmars. June 1, 1952. 17p. (NP-3999; U23218; TR-281-13)

NP-4000 5568
Cryogenic Lab., Ohio State Univ.
VAPOR PRESSURES OF INORGANIC SUBSTANCES. X. DISSOCIATION PRESSURES OF LITHIUM HYDROXIDE BETWEEN 650° AND 800° K; TECHNICAL REPORT, by Walter E. Ditmars and H. L. Johnston. June 1, 1952. 15p. (NP-4000; U23219; TR-281-14)

NP-4004 5571
Department of Mines and Technical Surveys (Canada)
THE DETERMINATION OF THORIUM IN ORES BY THE COLUMN METHOD. II. THE COLORIMETRIC ESTIMATION OF SMALL AMOUNTS OF THORIUM, by R. J. Guest. May 16, 1952. (NP-4004; TR-98/52)

NP-4010 5594
Mechanical Engineering Research Lab., East Kilbride, Glasgow (Scotland)
HEAT TRANSFER TO MERCURY, by D. L. R. Bailey, W. F. Cope and G. G. Watson. July 1952. 32p. (NP-4010; Heat Div. Paper No. 13)

NP-4011 5550
Air Force Radiation Lab., Univ. of Chicago
QUARTERLY PROGRESS REPORT NO. 4. July 15, 1952. 99p. (NP-4011; Quarterly Progress Report No. 4)

NP-4025 5595
Princeton Univ.
THERMODYNAMIC AND TRANSPORT PROPERTIES OF LIQUIDS. PROBLEM I. THERMAL CONDUCTIVITIES OF LIQUIDS. PROJECT SQUID (Final Report), by Ernest F. Johnson, Jr. and William J. Sheffy. Oct. 1, 1951. 7p. (NP-4025; Technical Memorandum Pr-17)

NP-4026 5551
Air Univ. School of Aviation Medicine
BEHAVIORAL CHANGES FOLLOWING RADIATION. II. MATERNAL BEHAVIOR AND MAZE PERFORMANCE, by C. Downing Tait, Jr., Patrick D. Wall, Muriel Balmuth, and Sylvan J. Kaplan. July 1952. 14p. (NP-4026)

NRL-3994 5586
Naval Research Lab.
PREPARATION OF SILICONE COMPOUNDS FOR USE IN HIGH-TEMPERATURE ORGANIC FINISHES—II, by Harold J. E. Segrave. June 24, 1952. 21p. (NRL-3994)

NRL-4013 5641
Naval Research Lab.
PULSED GEIGER TUBE OPERATION, by S. W. Lichtman. July 25, 1952. 17p. (NRL-4013)

NRL-Memo-33 5569
Naval Research Lab.
A STUDY OF THE SODIUM-HYDROGEN-OXYGEN SYSTEM, by Dale D. Williams. June 1952. 25p. (NRL-Memo-33; U22975)

TEM-362 5599
Geological Survey
GRAIN SIZE DISTRIBUTION IN THE SURFACE SANDS AND THE ECONOMIC PHOSPHATE DEPOSITS OF THE LAND-PEBBLE PHOSPHATE DISTRICT, FLORIDA, by David F. Davidson. Aug. 1952. 16p. (TEM-362)

USNRDL-353 5544
Naval Radiological Defense Lab.
PLASMA SULFHYDRYL LEVELS DURING GROWTH AND REGRESSION OF MURPHY RAT LYMPHOSARCOMA, by Bernard Shacter, Cecil Entenman and Michael B. Shimkin. June 26, 1952. 20p. (USNRDL-353)

NUCLEAR SCIENCE ABSTRACTS

Vol. 6 October 15, 1952 No. 19

BIOLOGY AND MEDICINE

5530
Iowa State Coll.
THE CARBON AND NITROGEN PRECURSORS OF BACTERIAL PURINES, by W. B. Sutton and C. H. Werkman. [nd] 13p. (AECU-2155)

The synthesis of purines in Aerobacter aerogenes was studied by culturing the organism in a dextrose ammonium sulfate medium with added isotopically labeled compounds. Glycine is incorporated into the 4, 5, and 7 positions of adenine and guanine of bacterial nucleic acids. CO_2 is incorporated into position 6 of these purine bases, and into positions 2 + 8 through reduction to formate. Acetate does not play a role in bacterial purine synthesis. N atoms in positions 1, 3, and 9 arise from the N of ammonium sulfate either directly or through some donor system. The synthesis of adenine and guanine by the same mechanisms present in animal tissue is strongly suggested. (auth)

5531
Sloan-Kettering Inst. for Cancer Research
THE UTILIZATION OF PURINE RIBOTIDES BY LACTOBACILLUS CASEI, by M. Earl Balis, Daniel H. Levin, George Bosworth Brown, Gertrude B. Elion, Henry Vanderwerff and George H. Hitchings. Sloan-Kettering Inst. for Cancer Research and Wellcome Research Labs. 17p. (AECU-2162)

The b isomers of the nucleotides of adenine and guanine were shown to support the growth of L. casei as effectively as the free bases. The a isomers and adenosine-5'-phosphate were greatly inferior in this respect. Incorporation data obtained by the use of ribonucleotides labeled in the purine ring with C^{14} were in agreement with the results of the growth studies. It appears probable that the observed activities of these ribotides are characteristic of the nucleotides per se. In an effort to find the locus of action of diaminopurine a number of adenine-containing mono- or dinucleotides were tested for their possible ability to reverse the inhibitory effect of 2,6-diaminopurine, but none of these was found to be effective. (auth)

5532
Iowa State Coll.
THIOMETHYLADENOSINE, by F. Schlenk. [nd] 6p. (AECU-2166)

The mechanism of thiomethyladenosine accumulation in yeast was studied by attempting to substitute homocysteine, methylmercaptane, methylmercaptoethanol, and methylmercaptopropionaldehyde for methionine as specific precursor. Negative results militate against transmethylation as the underlying mechanism. Tracer studies with methyl-C^{14}- and S^{35}-labeled methionine suggest transthiomethylation, with intermediate formation of a thetin-like compound tentatively termed methionyladenosine. The occurrence of another S-containing compound of this class, probably homocysteinyladenosine, is indicated. It appears that thiomethyladenosine is a split product of methionyladenosine.

5533
Iowa State Coll.
THE OCCURRENCE, FORMATION, AND ISOLATION OF THIOMETHYLADENOSINE, by Raymond L. Smith, Edward E. Anderson, Jr., R. N. Overland and F. Schlenk. [nd] 17p. (AECU-2167) (cf. NSA 6-812, 6-1072)

Further experiments on the formation of adenine thiomethylriboside have been carried out. Several yeasts have been examined for their ability to accumulate the nucleoside. Some of them were found to rival S. cerevisiae and T. utilis in forming thiomethyladenosine while others produce only small amounts of the nucleoside. Similar conditions were observed in some bacteria and molds. The presence of the nucleoside in rabbit liver is indicated. The survey of organic S compounds for their ability to substitute for methionine as precursor of thiomethyladenosine has been extended. Methionine seems to be specific and its L-isomer is superior to the D-isomer. The conversion of methionine into the nucleoside can be accomplished in maceration juice. Directions for securing yeast suitable for the isolation of thiomethyladenosine are given, and details of the purification are described. (auth)

5534
Argonne National Lab.
DESCRIPTION OF TECHNIQUE FOR ULTRA-THIN SECTIONING FOR ELECTRON MICROSCOPY, by Barbara W. Massey. July 1952. 12p. (AECU-2179; UAC-612)

A technique is described for obtaining thin sections of animal tissue suitable for electron microscopy. Fixation is accomplished by perfusion of the whole animal with neutral formalin or alcohol formalin followed by immersion of pieces to be examined in neutralized OsO_4. The embedding medium is a mixture of equal parts of n-butyl and ethyl methacrylate polymerized by ultraviolet light. Sectioning is done by means of a glass knife on an International ultra-thin sectioning microtome set at 0.1 μ. The sections are floated on warm water to spread, then placed on Formvar-coated grids, dried, and put into toluol to dissolve the plastic. The technique produces routinely usable, thin sections that show a minimum of damage owing to fixation, embedding, and sectioning. (auth)

5535
Institute for Atomic Research, Iowa State Coll.
METABOLISM OF SOYBEAN LEAVES. V. THE DARK REACTIONS FOLLOWING PHOTOSYNTHESIS, by D. W. Racusen and S. Aronoff. [nd] 31p. (AECU-2189)

In a study of dark reactions following photosynthesis of soybean leaves the rapid dark conversion of glyceric acid and sedoheptulose phosphate to alanine was investigated. Proof of the close metabolic relationship of alanine to glyceric acid and sedoheptulose was obtained by a series of experiments in which the relative activities of the three compounds were measured, and degradations of all three compounds were performed. The rate of change of total activity of alanine was in all cases oppositely directed to that of glyceric acid. Preillumination experiments were also shown to result in the accumluation of alanine. The mechanism and significance of the dark conversion to alanine are discussed. Malic acid was investigated as a possible precursor of sedoheptulose. The results indicate that the formation of malate during photosynthesis is a considerably more rapid process than synthesis via dark fixation. However, the labeling of 15-sec photosynthetic malate seems to preclude its being a precursor of sedoheptulose. (auth)

5536
Pennsylvania Univ. School of Medicine
BACTERIA AS CELLS AND AS ORGANISMS. SECTION ON NUCLEI AND CHROMOSOMES, by Edward D. DeLamater. [nd] 28p. (AECU-2190)

Methods are described for the preparation of bacterial specimens by the freezing-dehydration method, for the staining of specimens to show the structure of the chromosomes, and for differential staining of nucleic acids. Chromosomal changes during mitosis as demonstrated by these techniques are discussed. 51 references.

5537
Pennsylvania Univ. School of Medicine
ASPECTS OF BACTERIA AS CELLS AND AS ORGANISMS, by Stuart Mudd and Edward D. DeLamater. [nd] 33p. (AECU-2192)

The cytology of bacteria is reviewed. Immunochemical properties and relationships of bacteria and the interactions of bacteria with other organisms are discussed. 106 references.

5538
Naval Medical Research Inst., Bethesda
THE URINARY EXCRETION OF GALLIUM, by J. I. Munn and H. C. Dudley. Dec. 17, 1951. 20p. (NP-3731; R6279)

A method was devised for the quantitative estimation of Ga^{72} in urine, based on the colorimetric or fluorometric determination of the 8-hydroxyquinoline-Ga^{72} complex formed in a $CHCl_3$ solution containing Ga^{72} extracted from the urine with acidified diethyl ether. Intravenous injection of Ga^{72}-citrate in rabbits and dogs resulted in lower urinary excretion of Ga^{72} than when the animals were given the same doses subcutaneously. Urinary excretion of Ga^{72} during the first 24 hr subsequent to intravenous administration in humans varied from 4 to 78%. No correlation was observed between the clinical manifestations and the rate or amount of Ga^{72} excreted. The studies indicate that in both dogs and man the initial rate of urinary excretion of Ga^{72} is high and that it falls rapidly by 18 hr. Blood-Ga^{72} levels decline quickly after intravenous injection and reach low values within 6 hr. (Published in part in the J. Lab. Clin. Med. 37, 676(1951).) (NRS abst.)

5539
Atomic Energy Project, Univ. of Calif., Los Angeles
EFFECT OF SOME PREADMINISTERED DRUGS ON LUNG EDEMA PRODUCED BY BLAST INJURY, by B. Cassen, K. Kistler, and W. Mankiewicz. Issued Aug. 6, 1952. 14p. (UCLA-215)

Because a method had been developed for consistently producing marked pulmonary edema in mice by subjecting them to air blast, it was decided to investigate the effects of preadministering a series of common pharmacologically active drugs at various dosage levels and various modes of administration. Most drugs tried had no observable effect, but it was found that two substituted cholines, mecholyl and carcholin, markedly reduced the pulmonary edema produced by the blast. Pilocarpin showed a moderate effect when administered subdurally. No effect was observed of several adrenergic blocking agents, under the conditions of this study. (auth)

5540
Atomic Energy Project, Univ. of Calif., Los Angeles
METABOLISM AND URINARY EXCRETION OF SEVERAL FLAVONOID COMPOUNDS, by Thomas J. Haley and Murray Bassin. Issued Aug. 15, 1952. 8p. (UCLA-217)

A study has been made of the metabolism and urinary excretion of rutin, hesperidin, hesperidin methyl chalcone, naringin and phloroacetophenone. Whereas the latter compound is to a large extent excreted either free or combined, the flavonoids, with the exception of rutin, are presumed to be destroyed in the body. Rutin is partially destroyed in the body and partially handled by the usual phenol excretion pathways of sulfate and glucuronide. (auth)

5541
Atomic Energy Project, Univ. of Rochester
QUARTERLY TECHNICAL REPORT [FOR] APRIL 1, 1952 THRU JUNE 30, 1952, by Henry A. Blair. July 31, 1952. 71p. (UR-213)

The method for determining the dissociation constants of complex ions by use of cation exchange resins and radioactive isotopes is elaborated to include cases where the complex contains more than one metal atom and also where the metal ions polymerize in solution. Each of two batches of Armour's crystallized bovine serium albumin investigated contained a significantly large amount of strong anionic complexing agent. The urinary excretion of U was enhanced by the cyclic polyphosphate polymers while the other polymers either depressed the excretion or had no effect on this metal. Ten rats given Aldinamide or Rimifon, and twenty rats given Marsilid, during the acute radiation syndrome produced by 750 r of total-body x radiation showed no striking difference in their mortality rate, daily food consumption, weight gain, red blood count, or white blood count when compared with radiated untreated controls. Groups of four dogs each were exposed to 700 r x radiation while their abdomens were shielded. Intravenous injections of staphylococcus aureus on the 2, 6, and 9th post radiation days caused all four dogs so treated to die while only two of the controls died. The technique of preparative electrophoresis devised by Kunkel has been applied to the fractionations of C^{14}-labeled plasma proteins produced from lysine-E-C^{14} and amino acids by the intact rat, the isolated perfused rat liver, and the surviving eviscerated rat. A radiology educational program is described, and abstracts of papers presented at meetings are given.

5542
Atomic Energy Project, Univ. of Rochester
THE RELATIONSHIP OF THE CELL SURFACE TO METABOLISM. VIII. THE STIMULATION OF FERMENTATION BY EXTRACELLULAR POTASSIUM, by Aser Rothstein and Cenza Demis. July 1952. 24p. (UR-214)

In an acid medium, potassium stimulates anaerobic and aerobic fermentation of glucose and of fructose. Respiration of glucose, lactate, alcohol, and pyruvate is stimulated to a much lesser extent. Rb also stimulates fermentation, but to a lesser extent. Ammonium, Na, Li, Cs, Mg, and Ca all give a small but significant effect. None of these ions interfere with the K effect. All of them except Ca and Mg can participate in exchange for H ions from the cells during active fermentation, but also to a lesser extent than K. The effect of K on fermentation is dependent on the K concentration and on the H concentration, with, apparently, a direct competition of H^+ and K^+. The H^+ inhibits fermentation and K^+, in appropriate concentrations, can restore the rate to maximal. The higher the H^+ concentration the higher the requirement for K^+. The K effect is related to the presence of extracellular K. It is independent of net movements of K into or out of the cell and it is also independent of the intracellular K concentration. It has been suggested on the basis of these experiments that the phosphohexokinase reaction which requires K may be located in the periphery of the cell where it can be influenced by extracellular rather than intracellular concentrations of H^+ and K^+. (auth)

5543
Atomic Energy Project, Univ. of Rochester
CALCIUM COMPLEXES OF ATP AND ADP AND THEIR SIGNIFICANCE IN CALCIFICATION IN VITRO, by Victor DiStefano and W. F. Neuman. Aug. 12, 1952. 10p. (UR-215)

Tracer studies using radiocalcium and ion-exchange resins have demonstrated conclusively that calcium forms relatively undissociated complex ions with adenosinetriphosphoric acid (ATP) and adenosinediphosphoric acid (ADP). It has also been shown that the phosphatases present in rachitic bone cartilage liberate only small amounts of inorganic phosphate from ATP. These results explain the inhibitory effect of ATP on calcification in vitro. (auth)

5544
Naval Radiological Defense Lab.
PLASMA SULFHYDRYL LEVELS DURING GROWTH AND REGRESSION OF MURPHY RAT LYMPHOSARCOMA, by Bernard Shacter, Cecil Entenman and Michael B. Shimkin. June 26, 1952. 20p. (USNRDL-353)

When Murphy rat lymphosarcoma was transplanted into Sprague-Dawley rats, there was an initial lag phase in tumor growth, followed by a period of rapid proliferation. The tumors eventually reached a maximum size, ulcerated, and then regressed completely. During the phase of accelerative tumor growth, there was a marked decrease in the sulfhydryl content of the plasma. As the tumors regressed, the plasma sulfhydryl levels began returning to normal. Cortisone, administered to tumor-bearing animals, delayed the accelerative phase of tumor growth and the fall in palsma sulfhydryl levels for a few days. As the rate of tumor growth in cortisone-treated rats became accelerated, however, there was a concomitant fall in the plasma sulfhydryl concentration. The experiments were considered to lend support to the concept that decreases in plasma sulfhydryl levels are a reflection of markedly increased utilization of sulfhydryl groups by tissues. The suggestion was made that adrenal hormones may exert their inhibitory effect on tumor growth by inhibiting the utilization of sulfhydryl groups essential for tissue proliferation. (auth)

RADIATION EFFECTS

5545
Brown Univ.
THE ROLE OF THE INTESTINAL FLORA IN RADIATION INJURY; PROGRESS REPORT FOR MAY 1, 1951 TO DECEMBER 31, 1951, by H. B. Chase, P. F. Fenton, M. H. Hatch, W. Montagna and J. W. Wilson. [nd] 6p. (AECU-2165)

Lesions of the intestinal mucosa in mice following 1000- and 550-r x irradiations are described. Data indicate that the gastric emptying rate of solutions is inhibitied, but that intestinal absorption is not affected by 500 r of x radiation. Bacteriological studies of the intestinal flora of mice, and of tissues invaded by these organisms following irradiation, are reported.

5546
Biological Lab., Cold Spring Harbor
THE ESTIMATION OF ADAPTIVE VALUES OF EXPERIMENTAL POPULATIONS, by Bruce Wallace. Feb. 21, 1952. 21p. (AECU-2170)

The most direct method of estimating adaptive values of various genotypes is through observation of the rates of change in their relative frequencies in certain environments. When this method is inapplicable the adaptive values may be inferred from physiological studies. A situation of this sort, involving experimental populations of D. melanogaster, is described. A brief history of each population is reviewed. A summary of estimates of adaptive values obtained by a variety of techniques is given. Estimates obtained by the different methods vary. Nevertheless, an indication of the relative values emerges from the series as a whole. This indicates a decrease adaptive value resulting from chronic irradiation, and an improvement in adaptive value arising through the action of selection on either induced or spontaneous mutations. (auth)

5547
Chicago Univ.
THE GRAM-NEGATIVE FLORA OF THE UPPER INTESTINAL TRACT AND ITS INFLUENCE ON POST-IRRADIATION BACTEREMIA IN MICE, by C. Phillip Miller, Marianne Tompkins, Margaret Colling, Marjorie Bohnhoff and Carolyn W. Hammond. [nd] 7p. (AECU-2187)

A systematic study of the flora of the intestinal tract of mice exposed to 550 r of total-body x radiation showed an increase in all the Gram-negative bacilli in the upper half of the small bowel about the end of the first week post-irradiation. When the flora of the gut was changed artificially by introducing about 10^7 Pseudomonas aeruginosa, the effect produced increased with the lapse of time after exposure to irradiation. The sharpest rise in mortality due to Pseudomonas bacteremia occurred when this organism was introduced on the 11th day post-irradiation. (auth)

5548
Chicago Univ.
DURATION OF POST-IRRADIATION BACTEREMIA IN MICE, by Carolyn W. Hammond, C. Phillip Miller, Marianne Tompkins, Margaret Colling and Marjorie Bohnhoff. [nd] 8p. (AECU-2195)

Septicemia is a prominent manifestation of irradiation injury during the second week post-irradiation in mice exposed to moderate doses of x rays. Results of this study show that invasion by bacteria of the blood stream of irradiated mice invariably progresses to a fatal septicemia. The length of time an irradiated mouse can tolerate a blood stream invasion was found to depend upon the micro-organism involved. It may vary from a minimum of <18 hours when Pseudomonas is present to a maximum of 5 days when Paracolobactrum is the causative organism. (auth)

5549
Naval Medical Research Inst., Bethesda
RADIOLOGY AND RADIOACTIVITY EFFECTS OF WHOLE BODY IRRADIATION, by E. P. Cronkite and George Brecher. Nov. 15, 1951. 25p. (NP-3796; Lecture and Review Series 51-11; R6317)

Biological effects of whole-body irradiation are reviewed. Topics covered include dose measurements and lethal dose, survival time and clinical syndromes, intestinal injury, bone marrow injury, anemia, hemorrhage, infection, late effects, modification of response, and mechanics of protective action. A brief discussion of the medical aspects of atomic warfare is included. 165 references.

5550
Air Force Radiation Lab., Univ. of Chicago
QUARTERLY PROGRESS REPORT NO. 4. July 15, 1952. 99p. (NP-4011; Quarterly Progress Report No. 4)

Failure is reported in attempts to determine tyrosine in the presence of chloracetyltyrosine and cysteine. Kidney 5-nucleotidase was found to be inhibited by a suspension of blood cells and activated by simple two-hour aging at 37°C. The enzyme-inhibitor system consisting of carboxypeptidase a, carboxypeptidase b, and simultaneously occurring inhibitors (CPaI and CPbI) of these two enzymes were studied in a variety of normal and tumor tissues, and in the blood of normal and tumor-bearing animals. In contrast to normal rat and rabbit blood cells, the blood cells of tumor-bearing animals were found to be essentially free of CPaI. This is suggested as a possible test for the presence of neoplasia. Data are presented on the recovery in cell division rats of the irradiated amoeba when the organism is treated with different fractions of nonirradiated centrifuged amoebae. In a study of the effects of spleen homogenates on intermediary carbohydrate metabolism, evidence is presented for the presence of factors in radiosensitive tissues which stimulate and depress intermediary carbohydrate metabolism of other tissues. Data are presented on the effect of

radiation on alkaline phosphatase, 5-nucleotidase, and adenosine triphosphatase activity of tissues from normal and hibernating ground squirrels and on the effects of irradiation on the phosphorylated intermediates of glycolysis in ground squirrels and rats and the respiration, glycolysis, and activity of various oxidative enzymes in normal and hibernating ground squirrels. Data are included on the influence of various chemical agents, including methemoglobin formers, cytochrome oxidase inhibitors, and sulfhydryl enzyme inhibitors, on the mortality of mice poisoned with nitrogen mustard. Data are included on the effect of x irradiation, applied directly to the in situ dog heart, upon the K concentration in the coronary venous blood, as an indication of the effects of radiation on K concentration in the heart. The by-products of intermediary metabolism which appear in the expired air of normal human subjects were analyzed for acetone and ammonia and data are reported.

5551
Air Univ. School of Aviation Medicine
BEHAVIORAL CHANGES FOLLOWING RADIATION. II. MATERNAL BEHAVIOR AND MAZE PERFORMANCE, by C. Downing Tait, Jr., Patrick D. Wall, Muriel Balmuth, and Sylvan J. Kaplan. July 1952. 14p. (NP-4026)

Groups of white rats in their final week of pregnancy were exposed to single doses of 30, 90, 180, and 360 roentgens (in air). Only the heaviest exposure produced apparent deterioration in maternal behavior when compared with controls. Growth disturbance in offspring was correlated positively with size of dose. Both 90-r and 180-r offspring made significantly more maze errors than controls. (USAF abst.)

5552
Atomic Energy Project, Univ. of Calif., Los Angeles
FURTHER STUDIES ON THE MECHANISM OF PULMONARY CLEARANCE OF PRODIGIOSIN IN NORMAL AND X-IRRADIATED RABBITS, by George V. Taplin, James S. Grevior, Camille Finnegan, Arthur Dunn, and Philip Noyes. Issued Aug. 12, 1952. 17p. (UCLA-216)

In rabbits 800 r of whole-body x irradiation appears to accelerate the rate and increase the efficiency of the major mechanisms by which the lungs clear themselves of insoluble foreign particles following acute inhalation exposures. Cillary action and/or increased mucous secretion play a greater role than phagocytosis. Both mechanisms are more effective in γ-irradiated animals than in non-irradiated controls. Indirect indices of phagocytic function of the reticulo-endothelial (RE) system, such as spleen weight, celloidal dye retention in the blood and splenic uptake of inhaled insoluble prodigiosin dust, indicate that LD_{50} doses or larger of whole-body x irradiation produce an initial depression (0-14 days) of phagocytic function among the relatively resistant macrophages. Peak mortality rates occur during this same time interval, whereas in the succeeding two weeks, death rates decrease sharply. During this latter interval, spleen weight increases rapidly and is associated with a physiological rebound in respect to phagocytic function in the RE system. The possible clinical significance of the effectiveness of normal lung clearance mechanisms is discussed with respect to the inhalation hazards in atomic warfare, and in both industrial and clinical medicine. The findings also suggest that pharmacologic stimulation of functionally depressed RE cells during the acute phase of the radiation syndrome might be beneficial in conjunction with antibiotic therapy in reducing the mortality from bacterial causes. (auth)

RADIATION HAZARDS AND PROTECTION

5553
Argonne National Lab.
RADIATION DOSE REDUCTION BY CYSTEINE, by H. M. Patt, S. H. Mayer, R. L. Straube and E. M. Jackson. July 1952. 24p. (AECU-2177; UAC-610)

Cysteine has been shown to afford a relatively uniform protection against a number of x-radiation sequelae in the mouse (i.e., lethality, splenic atrophy, leucopenia, lymphopenia, and granulocytopenia). This implies that the protective action occurs at an early stage in the chain of events induced by irradiation and points to a true dose reduction. The proportional nature of the protection, i.e., deletion of a constant percentage of the biological effect which is independent of radiation dosage, has been observed for the various effects studied. The degree of protection against radiation lethality appears to increase linearly as the log of the cysteine dose. The results obtained with a split-exposure procedure, in which a standard dosage of cysteine was given between two radiation fractions or a proportional amount preceded each fraction, suggest that (1) irradiation just prior to cysteine administration does not influence the protection against subsequent exposure; (2) the lethal potential of small dosages of radiation cannot be reversed by cysteine under these conditions; and (3) the protective action of two suitably spaced cysteine injections is additive. The possibility that the modifying influence of cysteine may have a biological as well as a radiochemical basis has been considered. (auth)

RADIOTHERAPY

5554
TREATMENT OF MALIGNANT MELANOMAS WITH RADIOACTIVE PHOSPHORUS. Daudén Valls and Otte. Actas Dermo-Sifiligraficas 43, 358-60(1952) Jan. (In Spanish)

Results of P^{32} treatment of a melanoma with multiple metastases are reported. After treatment with P^{32} for 1.5 yr the patient has stopped eliminating melanin in the urine, feces, and sputum; an intestinal obstruction has disappeared; and many of the metastases to the skin have atrophied.

TOXICOLOGY STUDIES

5555
Argonne National Lab.
AN INVESTIGATION OF RADIUM DEPOSITION IN THE HUMAN SKELETON BY GROSS AND DETAILED AUTORADIOGRAPHY, by W. B. Looney and Lois A. Woodruff. June 1952. 34p. (AECU-2174; UAC-598)

A comprehensive picture of Ra deposition throughout the human skeleton is presented. Data are based on a series of gross and detailed autoradiographs of deposition in compact and trabecular bone. Photographs and detailed discussions of a number of autoradiographs are included.

5556
Argonne National Lab.
THE TOXICITY OF POLONIUM 210 IN MICE. I. THE 30-DAY LD_{50}, RETENTION, AND DISTRIBUTION, by Miriam P. Finkel, William P. Norris, Walter E. Kisieleski and Gertrude M. Hirsch. June 1952. 24p. (AECU-2176; UAC-609)

A method for the quantitative determination of Po^{210} in animal tissues is presented. The 30-day LD_{50} of Po given intravenously in HCl to young adult female mice was determined to lie between 30 and 40 μc/kg. The deleterious effects of 10 μc/kg were manifest as early as 2 weeks after injection by failure of the mice to grow. Data on tissue distribution and excretion of Po in mice are included.

TRACER APPLICATIONS

5557
California Univ., Davis. Dept. of Animal Husbandry
THE METABOLIC FECAL NITROGEN EXCRETION OF THE YOUNG CALF AND THE TRUE DIGESTIBILITY OF CASEIN, by G. P. Lofgreen and Max Kleiber. [nd] 16p. (AECU-2183)

The metabolic fecal N excretion of four young dairy calves has been determined by feeding casein labeled with P^{32} in-

corporated into a purified liquid diet. The average metabolic N excretion was 0.27 g/100 g of dry-matter intake. The validity of this value is discussed. The true digestibility of the N of the casein used in these studies averaged 93.5%. (auth)

5558
California Univ., Citrus Experiment Station, Riverside
TRANSLOCATION OF RADIOACTIVE OCTAMETHYL PYROPHOSPHORAMIDE IN BLACK VALENTINE BEAN PLANTS, by Randolph T. Wedding and Robert L. Metcalf. [nd] 20p. (AECU-2184)

The systemic insecticide octamethyl pyrophosphoramide, which is also known as bis-(bis-dimethylamino phosphonous) anhydride or OMPA, was labeled with P^{32} and used in a study of its translocation in bean plants of the Black Valentine variety after its uptake through the roots. This material tended to accumulate more rapidly in the younger tissues of the plant than in the older ones. This was true of both stem and leaf tissues. The P^{32}-containing compounds detected in the plant were toxic to insects, as determined by bioassay. Insecticidally inactive breakdown products of OMPA were found after 8 days of exposure.

5559
Pennsylvania Univ. School of Medicine
THE RELATION OF α-METHYLBUTYRATE TO ISOLEUCINE METABOLISM. II. PROPIONATE FORMATION, by Minor J. Coon, Norman S. B. Abrahamsen, and Grace S. Greene. [nd] 24p. (AECU-2185)

The synthesis of 2-methyl-C^{14}-butyric acid from radioactive methanol by means of a malonic ester synthesis is described. The metabolic fate of this compound was studied, and it was shown to give rise to labeled propionate, acetoacetate, and CO_2 in liver tissue. Under similar conditions 2-methyl-butyrate-3-C^{14} fails to produce labeled propionate although it furnishes radioactive "acetate," acetoacetate, and CO_2. This indicates that C^{14} does not enter propionate indirectly by way of any of these three products. It is proposed that methylbutyrate undergoes β oxidation on the longer carbon chain and cleavage to produce "acetate" and propionate. In order to explain the observation that the acetoacetate derived from 2-methyl-C^{14}-butyrate is completely labeled, it is postulated that this may reflect randomization of isotope between the α and β carbons of pyruvate formed from propionate. The data presented do not rule out the possibility, however, that other pathways may be involved in methylbutyrate metabolism. Carbons 3 and 4 of methylbutyrate furnish a terminal 2-carbon unit, which is exceptional in that it gives rise to acetoacetate labeled almost symmetrically. It has been shown that this result cannot be explained on the supposition that propionate or other metabolites arising from isoleucine and methylbutyrate are capable of influencing the distribution of 2-carbon units entering acetoacetate. (auth)

CHEMISTRY

5560
Illinois Univ.
TEMPERATURE COEFFICIENT OF THE INTERMOLECULAR CARBON ISOTOPE EFFECT IN DECARBOXYLATION OF NORMAL MALONIC ACID, by Peter E. Yankwich, R. L. Belford and Gideon Fraenkel. [nd] 16p. (AECU-2186)

The intermolecular carbon isotope effect in the decarboxylation of isotopically normal malonic acid has been measured in 80% aqueous H_2SO_4 in the range 56 to 129°C. The results are not in accord with predictions based on the simplified model of Bigeleisen. The temperature coefficients of the corresponding oxygen isotope effects (O^{17} and O^{18}) have been found to be negligible. It is concluded that the mechanism of decarboxylation in 80% H_2SO_4 is similar to that in dilute HCl solution, as reported by Hall. (auth)

5561
Washington Univ., St. Louis
THE REACTIONS OF ARYL ESTERS OF PHOSPHOROUS ACID WITH IODINE (thesis), by James P. Forsman and David Lipkin. [nd] 23p. (AECU-2188)

The reactions of I with triphenyl phosphite, cyclohexyl diphenyl phosphite and 1,2:5,6-diisopropylidene-D-glucose 3-diphenylphosphite have been investigated. In the case of all three esters the principal reaction is the formation of phosphite polyiodides. Conditions for the reaction of the cyclohexyl ester have been found, however, which lead to excellent yields of cyclohexyl iodide. Two P compounds of novel structure have been obtained from the reaction of anhydrous NH_3 with a solution of triphenyl phosphite and I. (auth)

5562
Argonne National Lab.
ELECTROLYTIC REDUCTION OF PERRHENATE. I. STUDIES IN PERCHLORIC, ETHANESULFONIC, TRIFLUORACETIC AND HYDROCHLORIC ACIDS, by J. C. Hindman and Philip Wehner. May 1952. 12p. (ANL-4845; AECU-2112; UAC-577)

This report was issued as AECU-2112 and abstracted in Nuclear Science Abstracts as NSA 6-4726.

5563
Argonne National Lab.
ELECTROLYTIC REDUCTION OF PERRHENATE. II. STUDIES IN SULFURIC ACID, by Philip Wehner and J. C. Hindman. May 1952. 13p. (ANL-4846; AECU-2110; UAC-579)

This report was issued as AECU-2110 and abstracted in Nuclear Science Abstracts as NSA 6-4725.

5564
Bureau of Mines
SOME THERMODYNAMIC VALUES FOR FERROUS OXIDE, by G. L. Humphrey, E. G. King, and K. K. Kelley. June, 1952. 19p. (BM-RI-4870)

New experimental data are reported on the heat of formation of ferrous oxide determined by two methods (combustion calorimetry and solution calorimetry) and employing material of unequivocal composition. The results are compared with values obtained from data for the H reduction, CO reduction, and disproportionation reactions of ferrous oxide, and a best value is selected. A table of heat and free energy of formation values of ferrous oxide to 2000°K is given. These values are combined with available data for water, CO, and CO_2 to obtain theoretical heats and free energies of reduction corresponding to the selected heat of formation. H and CO reduction equilibria are compared, and the differences in trend with temperature and percentage utilization of the reductants are considered. (auth)

5565
Tour, Sam and Co., Inc.
FINAL TECHNICAL REPORT; NITRIDING AND CARBONITRIDING OF TITANIUM METAL AND ITS ALLOYS, by Edmond J. Silk. May 12, 1952. 38p. (NP-3956; WAL Report 401/49-9; U22748)

Methods for producing an adherent hard case on RC-55 ductile Ti and several higher-strength Ti alloys were studied. The apparatus used consisted of a resistance-wound insulated furnace shell and a quartz treating chamber. Temperature control was accomplished with a Tour potentiometric controller-pyrometer unit; the 26-gage Chromel-Alumel thermocouple was sealed in a quartz sleeve. Specimens were treated in NH_3, exhausted continuously through a dissociation analyzer, for 3 to 64 hr at 900 to 1700°F (100° intervals).

This treatment produced a hard adherent case on Ti and the alloys. The minimum temperature and time for appreciable surface hardening were 1600°F and 16 hr, respectively. Tank N gave similar hard adherent cases at a minimum temperature of 1800°F. No case depths were over approximately 0.003 in. The RC-55 metal, treated at 1600 to 1700°F for 64 hr, showed a marked reduction in hardness; the alloys failed to show a similar loss. (NRS abst.)

5566
University of Southern Calif.
STUDY OF THE PROPERTIES OF MICELLES; FIRST TECHNICAL REPORT [ON] NEW METHOD OF DETERMINING DIFFUSION COEFFICIENTS, by Karol J. Mysels and Dirk Stigter. June 1952. 60p. (NP-3960; U22707)

Methods were investigated for measuring diffusion in micelles of association colloids, particularly soaps and detergents, by means of dyes insoluble in H_2O and solubilized in the micelle. A porous-diaphragm method was selected which involved impregnating two thick fritted-glass disks with two solutions identical except for the presence of a tracer dye in one, placing the disks on top of each other for a given time, and analyzing the solutions washed from each disk; the fritted glass immobilized the liquids and insured that transfer of dye from the dye-containing solution occurred only by diffusion. The diffusion coefficient was determined by comparing the times required to obtain a given amount of transport for NaCl and the unknown. The method has a precision of about 0.5% or 5 times the analytical error, whichever is greater. The disks darkened with use and gave erratic results after 2 months; cleaning with HNO_3 removed the discoloration and restored reproducibility. Problems are discussed relating to control of evaporation, leakage, cutting and mounting, disk cleaning, filling and washing of disks, volume determination, boundary formation, calibration, extent of diffusion, disk size, leveling, effect of density gradients, vibration, temperature control, and conductometric and colorimetric analysis. A free-diffusion method in a wide channel was considered as an alternate to the diaphragm method. The liquid column was stabilized by a density gradient obtained by using D_2O instead of H_2O in the lower layer. The concentrations of the layers were determined by light absorption. (NRS abst.)

5567
Cryogenic Lab., Ohio State Univ.
VAPOR PRESSURES OF INORGANIC SUBSTANCES. IX. TITANIUM BETWEEN 1587° AND 1764° K, AND COPPER BETWEEN 1143° AND 1292° K; TECHNICAL REPORT, by James W. Edwards, Herrick L. Johnston, and Walter E. Ditmars. June 1, 1952. 17p. (NP-3999; U23218; TR-281-13)

The vapor pressures of Cu and Ti were determined by the Langmuir vacuum-evaporation method. Heats of sublimation at absolute zero were calculated. Vapor pressure (P)–temperature (T) curves were obtained from the equations: $\log P = 7.7960 - 0.000227\,T - (24644/T)$ for Ti and $\log P = 6.9214 - (17546/T) - 0.0001659\,T$ for Cu. The accommodation coefficients are unity. A spectral emissivity value of 0.43 was obtained for pure Ti. Mean ΔH_0°'s of 112,763 and 80,287 cal/mole were calculated for Ti and Cu, respectively. Cooling-curve data confirmed McQuillan's conclusion (J. Inst. Metals 78, 249(1950)) that a sharp first-order transition from the α to the β form of Ti occurs near 882.5°C. (NRS abst.)

5568
Cryogenic Lab., Ohio State Univ.
VAPOR PRESSURES OF INORGANIC SUBSTANCES. X. DISSOCIATION PRESSURES OF LITHIUM HYDROXIDE BETWEEN 650° AND 800° K; TECHNICAL REPORT, by Walter E. Ditmars and H. L. Johnston. June 1, 1952. 15p. (NP-4000; U23219; TR-281-14)

The dissociation pressure of LiOH (99.9% pure) between 648 and 795°K was measured by the dynamic effusion method. Ni Knudsen cells with varying orifice diameters were used in a simple high-vacuum apparatus. No reaction was apparent between the Ni and Li compounds or between the Ni and H_2O vapor. A straight-line curve presented by the test data fitted the empirical equation: $\log P\ (\text{atm}) = -7635.1/T + 5.6786$. Discrepancies between the calculated (0.02) and the observed (0.14) standard deviation were attributed to uncertain weight loss (ΔW) values. A value of $\Delta H_0^\circ = 34{,}942$ cal/mole was obtained, compared to Bauer's $\Delta H_{25}^\circ = 32{,}821$ cal/mole (J. Am. Chem. Soc. 73, 1119(1951)). (NRS abst.)

5569
Naval Research Lab.
A STUDY OF THE SODIUM-HYDROGEN-OXYGEN SYSTEM, by Dale D. Williams. June 1952. 25p. (NRL-Memo-33; U22975)

The Na-H-O system was studied by reacting Na, NaOH, Na_2O, and NaH in a metal pot heated by a helical-coil nichrome heater furnace which was controlled by a variable transformer. The pot was connected to a pyrex calibrated flask and a differential manometer; an outlet was provided to a high-vacuum, inert-gas manifold. Temperature-pressure relationships were determined up to 700°C, and the reaction products were analyzed. The stainless-steel (type 304) pot was not attacked by NaOH below 600°C, while the Ni pot was not attacked below 700°C. Above 300°C Na reacted with NaOH to form Na_2O and NaH. With vacuum at the beginning of the reaction, H was liberated to the extent of the dissociation pressure of NaH below 385°C. If H were not removed and the temperature were over 385°C, an equilibrium resulted which did not follow the dissociation-pressure diagram for NaOH. Dissociation of NaH was suppressed during the reaction of Na with NaOH when the gas pressure was as low as 200 mm, and the NaH was maintained in solution even at 600°C. Dissociation of NaH was suppressed by inert gas pressure as low as 190 mm. NaH was indicated to vaporize or sublime before it dissociates. The equilibrium pressure of H over an Na_2O-NaOH-NaH mixture and over Na was dependent largely on the amount of Na_2O or upon the ratio $NaOH/Na_2O$. Reabsorption of H at higher temperatures required Na_2O and was brought about by the increased solubility of NaH in NaOH and the more fluid nature of the melt. (NRS abst.)

ANALYTICAL PROCEDURES

5570
Argonne National Lab.
ETHYLENEDIAMINE–A CARBONATE-FREE ALKALI FOR CO_2 ABSORPTION, by Robert W. Swick, Donald L. Buchanan and Akira Nakao. June 1952. 2p. (AECU-2168; UAC-568)

Complete recovery of purified CO_2 from "wet" oxidations, acidified carbonates, and other reactions has been obtained in a vacuum apparatus by the use of a proper sequence of cold traps and heated reaction tubes. However, in many reactions which yield CO_2, gaseous impurities are evolved which like CO_2 do not condense in a Dry Ice trap but only at the temperature of liquid N. Most of these are best removed by trapping the gas mixture in alkali and subjecting the alkaline carbonate to a vacuum before acidifying to release the CO_2. Despite careful preparation and handling, solutions of alkali usually contain small quantities of carbonate. A simple and effective method of eliminating the resulting undesired blank is described. Ethylenediamine and water are distilled from reservoirs on the vacuum manifold and frozen into a vessel fitted with a stopcock. After the impure CO_2 is also frozen into this vessel (with liquid N), the stopcock is closed and the mixture warmed to room temperature. Evacuation then removes neutral and alkaline gases. Subsequent

acidification with heating releases CO_2 quantitatively. With an excess of water present, HCl as a contaminant is not evolved in measurable quantities, but SO_2, being a weaker acid, is not retained upon acidification. Other acid gases probably behave as these do, their retention depending on their acid strength. The measured blank of vacuum distilled ethylenediamine was 0.001% of its CO_2 binding capacity. To test completeness of recovery five purified CO_2 samples were measured manometrically and then absorbed in a 10-fold excess of a 1 : 4 ethylenediamine-water mixture. After evacuation the samples were acidified with a two fold excess of 50% H_2SO_4, heated to about 80°C, and the evolved CO_2 was collected and again measured. The mean recovery was 99.8 ± 0.2% (standard error). When the solutions were unheated or heated and allowed to cool before collecting the CO_2 the recovery was low, usually by 2 to 4%. With carbonate so easily and effectively removed it is suggested that vacuum-distilled ethylenediamine might find wide usefulness as an absorbing agent in chemical and radioactive analyses requiring the collection of CO_2. (Entire report)

5571
Department of Mines and Technical Surveys (Canada)
THE DETERMINATION OF THORIUM IN ORES BY THE COLUMN METHOD. II. THE COLORIMETRIC ESTIMATION OF SMALL AMOUNTS OF THORIUM, by R. J. Guest. May 16, 1952. (NP-4004; TR-98/52)

A colorimetric method for the determination of microgram amounts of Th with 1-(O-arsonophenylazo)-2-naphthol-3,6-disulphonic acid is described. Samples containing as low as 0.001% ThO_2 can be analyzed successfully. The method is used in conjunction with the column method of separation when the amount of ThO_2 in the sample is 1% or less. By using La as a carrier, small amounts of Th may be recovered by means of an oxalate precipitation. A small correction is made for the effect of La on the color development. The accuracy of the method compares favorably with other methods for Th determination. For samples containing over 1% ThO_2, the gravimetric finish is preferable. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

5572
ANOMALOUS MIXED CRYSTALS IN THE SYSTEM CERIUM DIOXIDE–URANIUM OXIDE. F. Hund, R. Wagner, and U. Peetz. Z. Elektrochem. 56, 61-5(1952) Jan. (In German)

The system CeO_2-UO_x, prepared by evaporating Ce and uranyl nitrate solutions and heating at 1200°C, exhibited a fluorite phase from 0 to 63 mole % UO_2, the lattice constant of which varied from 5.399 ± 0.001 to 5.431 ± 0.001 kX. The weight loss of several preparations at 1000°C in high vacuum were measured; the relative weight loss was greatest at low U content. Pyknometric densities were determined at 25°C, and densities were calculated for three possible lattice arrangements. The mixed crystals have an essentially intact cation lattice with excess O between lattice positions. The question of the valence state in mixed crystals of oxides having two principal valences is discussed.

5573
THE FLUORITE PHASE IN THE SYSTEM PRASEODYMIUM OXIDE–URANIUM OXIDE. F. Hund and U. Peetz. Z. Elektrochem. 56, 223-8(1952) Mar. (In German)

Two fluorite phases were found to occur in the system Pr_6O_{11}–U_3O_8. Phase I extends from 0 to 40.2 mole % U_3O_8, the lattice constant decreasing linearly from 5.525 ± 0.004 to 5.458 ± 0.001 kX. Phase II extends from 40.2 to ~71 mole % U_3O_8 with another linear drop in the lattice constant to 5.431 ± 0.001 kX. Pyknometric densities were measured and compared with calculated densities of possible structures. The anomalous mixed crystals of both phases have an intact cation lattice. A valence change is probable. Randomly distributed anion-lattice vacancies occur in the Pr_6O_{11} structure. Electron mobility, formula, and color of Pr_6O_{11} are related to the structure. The many color changes in the Pr_6O_{11}–U_3O_8 system are discussed.

5574
THE THORIUM-SELENIUM SYSTEM. R. W. M. D'Eye, P. G. Sellman, and J. R. Murray. J. Chem. Soc., 2555-62 (1952) July.

Thermal, metallographic, x-ray, and chemical analyses have unambiguously identified four phases in this binary system: (i) ThSe, which exists over a narrow solid-solution range, is face-centered cubic with a = 5·863 ± 0·002 X.U. and has the NaCl-type structure; (ii) Th_2Se_3, which again has a narrow solid-solution range, has an x-ray pattern which can be indexed in terms of an orthorhombic cell with a = 11·32 ± 0·05, b = 11·55 ± 0·05, and c = 4·26 ± 0·1 ± X.U., and four molecules per unit cell, the extinctions being compatible with the Sb_2S_3-type structure; (iii) Th_7Se_{12} also gave a complex pattern which was indexed as a hexagonal cell with a = 11·56, c = 4·35 ± 0·05 X.U.; (iv) $ThSe_2$, which loses Se when heated above 1000°C, being degraded to $ThSe_{1.7}$, has a structure compatible with the orthorhombic $PbCl_2$-type with a = 4·98, b = 7·50, c = 9·38 X.U. (all ± 0·01). A tentative phase diagram is given for the composition range $ThSe_{0-1.7}$. Above $ThSe_2$ the further compound Th_7Se_7 has been identified by degradation experiments. The Th used contained up to 0·5% of O (≡ 5% of ThO_2). Consequently, ThOSe is found as a contaminant in the system. It has little effect on the phase diagram for, apart from the range $ThSe_{0.7}$–$ThSe_{1.1}$, where melting points were above 1660°C, it occurred as a discrete phase. ThOSe is tetragonal, with a = 4·030 ± 0·005, c = 7·005 ± 0·005 X.U., and has two molecules per unit cell. The space group is D_{4h}^7 – P4/nmm (PbFCl-type structure) with the O atoms on 2(a)- and Th and Se atoms on 2(c)-fold special positions. The variable parameters for Th and Se, determined by comparison of calculated and observed intensities, are z_{Th} = 0·18 ± 0·005 and z_{Se} = 0·63 ± 0·01.

FLUORINE AND FLUORINE COMPOUNDS

5575
THE MERCURY-PHOTOSENSITISED REACTIONS OF TETRAFLUOROETHYLENE. B. Atkinson. J. Chem. Soc., 2684-94(1952) July.

The main products of the Hg-photosensitized reactions of tetrafluoroethylene at 30°C have been identified as hexafluorocyclopropane and polytetrafluoroethylene. The variations of rates of formation of these products with pressure of tetrafluoroethylene and with intensity of light have been studied. Some observations on the effects of polymer dust and hexafluorocyclopropane on the rates of reaction are discussed. Over the pressure range 1 to 35 cm the quantum efficiency of formation of hexafluorocyclopropane increases with increasing pressure. At 5 cm the quantum efficiency is almost independent of intensity but at higher pressures an increase in intensity was found to lower the quantum efficiency. It is shown that the experimental results are fairly well represented by a mechanism involving scission of tetrafluoroethylene into difluoromethylene, followed by addition of the free radicals to tetrafluoroethylene to form hexafluorocyclopropane or to initiate polymerization. A high proportion of the free radicals recombine either in the gas phase or at the walls. The reaction of tetrafluoroethylene is contrasted with the Hg-photosensitized reactions of ethylene.

GRAPHITE

5576
Knolls Atomic Power Lab.
THERMAL CONDUCTIVITY, ELECTRICAL RESISTIVITY AND THERMOELECTRIC POWER OF GRAPHITE, by W. W. Tyler and A. C. Wilson, Jr. June 30, 1952. 21p. (AECU-2199)

The thermal conductivity, electrical resistivity, and thermoelectric power have been measured in the temperature range 20 to 300°K for samples of artificial extruded graphite, natural molded graphite and lampblack graphite. Owing to the very large Wiedemann-Franz ratio and its dependence on temperature and type of graphite, thermal conductivity in graphite is attributed primarily to lattice waves. Scattering of lattice waves from crystallite boundaries limits the conductivity through most of the temperature range investigated. Interpretation of the data in terms of the simple Debye equation for lattice conductivity permits rough estimates of effective crystallite size. At low temperatures, the dependence of conductivity on temperature is more rapid than the dependence of heat capacity, in disagreement with the Debye equation. The temperature dependence of electrical resistivity is interpreted using a modified Wallace zone theory which permits the Fermi level to differ in position from the zone boundary, due to an excess or deficit of electrons. Scattering of electrons in the temperature range of interest is attributed to crystallite boundaries or impurities and is assumed temperature independent. The temperature dependence of the Fermi level that gives the best fit to experimental data is not in agreement with theoretical predictions. (auth)

5577

GRAPHITE. J. Lomas. Mine and Quarry Eng. 17, 363 (1951).

An abstract appeared in Brit. Ceram. Abstracts, abstr. 741(1952) and is reproduced here in its entirety.

General properties of graphite are noted. The most important industrial varieties are massive-crystalline, flake, and amorphous. Mica is a frequent impurity difficult to remove. The principal sources are in Korea, U. S. A., Canada, Austria, Ceylon, Madagascar, Mexico, Italy, Norway, India, and Russia. The primary use of graphite is for crucibles. Data are given on the grinding of graphite in disk crushers and ball mills.

LABORATORIES AND EQUIPMENT

5578

Argonne National Lab.

RADIOACTIVE COBALT LABORATORY FOR CHEMICAL RESEARCH, by Roland A. Blomgren, Edwin J. Hart and Leon S. Markheim. July 17, 1952. 21p. (AECU-2178; UAC-611)

The essential features of two Co^{60} γ-ray irradiation chambers designed primarily for chemical studies are described. The "multisource chamber" holding up to a maximum of five separate Co^{60} sources in a moveable shield mounted on top of the chamber is designed basically for studies on the effect of dosage rate. Up to a total of 100 c of cobalt activity may be housed in this chamber. The "double cavity irradiation chamber" is provided with a single 400-c Co^{60} source which may be lowered into either of two irradiation cavities. One of these cavities is a thermostated well that may be maintained at constant temperatures in the range −30°C to 130°C. Two intermittent γ-ray devices also are described. (auth)

5579

Vitro Corp. of America

QUARTERLY PROGRESS REPORT [FOR] APRIL-JUNE, 1952 [ON] DEVELOPMENT OF LABORATORY WASTE DISPOSAL UNIT. July 26, 1952. 7p. (KLX-1378)

The design and performance characteristics of a laboratory radioactive-waste disposal unit are given. Tests are reported on decontamination of various materials.

RADIATION CHEMISTRY

5580

Wisconsin Univ.

EFFECT OF BROMINE CONCENTRATION ON THE PRODUCTS OF THE REACTIONS OF CARBON TETRACHLORIDE WITH BROMINE ACTIVATED BY RADIATIVE NEUTRON CAPTURE AND BY ISOMERIC TRANSITION, by J. F. Hornig and J. E. Willard. [nd] 18p. (AECU-2171)

The yields of radioactive CCl_3Br, CCl_2Br_2, and higher boiling compounds resulting from radiative neutron capture and isomeric transition of Br dissolved in CCl_4 have been studied as a function of Br concentration. The total organic yield (fraction of events resulting in stable organic combination of product atom) from each mode of activation decreases very rapidly from about 35% at 0.01 mole % Br to about 20% at 15 mole % Br. This decrease in organic yield is primarily at the expense of the CCl_3Br product. In the same concentration range the yield of CCl_2Br_2 increases, while the yield of higher boiling activity decreases. After 15 mole % of Br has been added, the total and individual yields of organic products decrease almost linearly to zero at 100% Br. The relative yield of the various organic products is, within experimental error, independent of whether the initial activation was by radiative neutron capture or isomeric transition. The total organic yield is slightly higher for the isomeric transition. At high Br concentrations part of the radioactive Br formed by both isomeric transition and radiative neutron capture enters combination as CBr_4. (auth)

RADIATION EFFECTS

5581

Argonne National Lab.

LUMINESCENCE OF ICE AND TRITIATED ICE, by Leonard I. Grossweiner and Max S. Matheson. July 9, 1952. 3p. (AECU-2175; UAC-602)

Pure ice at low temperature was found to emit ultraviolet radiation when excited by filtered 50-kv W x rays. Self-induced luminescence was detected in tritiated ice. Experimental procedures followed in this study are described.

RARE EARTHS AND RARE-EARTH COMPOUNDS

5582

RARE EARTH FERRITES WITH DOUBLE FERROMAGNETIC CURIE POINTS. Hubert Forestier and Georges Guiot-Guillain. Compt. rend. 235, 48-50(1952) July 7. (In French)

Thermomagnetic investigation from 30 to 450°C of rare earth ferrates(III) of the form $Fe_2O_3.M_2O_3$, previously annealed at 1050°C for 48 hr, showed the presence of two Curie points for the compounds in which M = Y, Sm, Gd, Tm, or Yb, as follows: Y, 275, 370; Sm, 295, 405; Gd, 285, 395; Tm, 265, 360; Yb, 255, 355°C. The explanation considered most plausible attributes one Curie point to the trivalent Fe ion, the other to the rare-earth ion.

5583

DILATOMETRIC STUDY OF METALLIC GADOLINIUM. Félix Trombe and Marc Foëx. Compt. rend. 235, 42-4 (1952) July 7. (In French)

The coefficient of expansion of ferromagnetic Gd has been determined from −195 to +300°C. Below the Curie point (16 ± 2°C) as far as −140°C the coefficient is extremely small, the curve of coefficient vs. temperature being quite flat. At ~20°C, the curve bends sharply upward, thus differing markedly from true ferromagnetic substances. Between 100 and 200°C a weak dilatometric transformation occurs with hysteresis. Below −140°C the coefficient is positive and appreciable.

5584

DILATOMETRIC STUDY OF METALLIC DYSPROSIUM. Félix Trombe and Marc Foëx. Compt. rend. 235, 163-5 (1952) July 16. (In French)

The coefficient of expansion of ferromagnetic Dy has been determined from −195 to +300°C. Between −90 and +300°C the coefficient increases regularly with temperature; at room temperature its value is of the order of 8×10^{-4}, nor-

mal for rare earth metals. At −90°C, a sharp bend in the curve and a decrease in the coefficient coincides with the magnetic anomaly at −94°C. With lower temperatures the coefficient progressively increases, but below the Curie point, −168°C, seems to decrease once more. These phenomena were reversible and were not changed by annealing at 300°C. As with Gd, the dilatometric behavior at magnetic transition points differs appreciably from that of true ferromagnetics.

SYNTHESES

5585
California Univ., Berkeley. Coll. of Agriculture
PREPARATION OF MALTOSE LABELED WITH C^{14} IN THE REDUCING OR NONREDUCING GLUCOSE COMPONENT, by Charlotte Fitting, E. W. Putman and W. Z. Hassid. [nd] 9p. (AECU-2191)

Two kinds of radioactive maltose preparations were synthesized by using the maltose phosphorylase from Neisseria meningitidis which catalyzes the reversible reaction, maltose + inorganic phosphate ⇌ β-D-glucose-1-phosphate + glucose: (a) α-D-glucopyranosyl-D-glucose (C^{14}-labeled in the reducing unit), and (b) α-D-glucopyranosyl-D-glucose (labeled with C^{14} in the nonreducing unit). (auth)

5586
Naval Research Lab.
PREPARATION OF SILICONE COMPOUNDS FOR USE IN HIGH-TEMPERATURE ORGANIC FINISHES—II, by Harold J. E. Segrave. June 24, 1952. 21p. (NRL-3994)

The investigation of silicone polymer systems for use in high-temperature resistant coatings has been extended. The effect of meta- and para-fluorophenyl and of meta-trifluoromethylphenyl groups on silicone resins containing them has been determined. These single substituents failed to improve the heat resistance of the resins. Silicones prepared directly from Grignard reaction mixtures were shown to be inferior to those prepared from pure chlorosilanes at the same charge ratios. A silicone resin prepared by a process developed under contract to the U. S. Army Signal Corps was equivalent in heat resistance to commercially available silicone protective coating resins. The results have been discussed in the light of currently accepted theories of silicone resin preparation and performance, and recommendations have been made accordingly. (NRL abst.)

TRANSURANIC ELEMENTS AND COMPOUNDS

5587
Atomic Energy Research Establishment, Harwell, Berks (England)
BIBLIOGRAPHY ON AMERICIUM. Apr. 1952. 6p. (AERE Inf/Bib-86)

A bibliography on Am reports, listed in report number order, and on published literature taken from Chemical Abstracts from 1945 is presented. References are listed in order of date of publication and in alphabetical order of authors when there are several in the same date.

5588
MAGNETOCHEMISTRY OF THE HEAVIEST ELEMENTS. PART VII. SODIUM PLUTONYL ACETATE. J. K. Dawson. J. Chem. Soc., 2705-7(1952) July.

The magnetic susceptibility of $NaPuO_2(C_2H_3O_2)_3$, measured over the temperature range 90 to 300°K, follows the Curie law exactly and agrees with the theoretical spin-only value for two unpaired electrons. This is taken as evidence that the ground state of the plutonyl ion has a $6d^1$ electron configuration.

URANIUM AND URANIUM COMPOUNDS

5589
THE SOLUBILITY OF URANYL OXALATE IN NITRIC ACID. C. B. Amphlett and O. T. Davidge. J. Chem. Soc., 2938-9 (1952) July.

The solubility curve of $UO_2C_2O_4.3H_2O$ in HNO_3 has been extended to 70 wt % acid. A sharp break at ~33 wt % indicates dehydration analogous to that of uranyl nitrate in HNO_3, the curve above this point being the solubility of $UO_2C_2O_4$.

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

5590
Illinois Inst. of Tech.
PRESSURE DROP IN TWO PHASE FLOW (thesis), by David Howard Weiss. June 1952. 77p. (AECU-2180; UAC-613)

The purpose of this study was to investigate experimentally two-phase flow in a single vertical channel, which was uniformly heated. The channel was a 0.174-in. I. D., 24-in. long electrically heated stainless steel tube through which distilled water was passed. The variation of pressure drop with system pressure, inlet temperature and velocity, and heat flux was determined. The conditions under which the tube fails due to local overheat was determined. An investigation was made of the characteristics of the single vertical heated channel when operating in parallel with a large number of vertical unheated channels. These data may be applied in developing methods of calculating two-phase pressure drop for use in the design of equipment for heat transfer in forced circulation at high heat flux. Use of the Martinelli and Nelson method of calculating the pressure drop is illustrated. (auth)

5591
Ohio State Univ.
A NEW-TYPE HEAT INTERCHANGER FOR LARGE LIQUEFIERS, by J. Nicol, T. S. Smith, C. V. Heer and J. G. Daunt. [nd] 17p. (AECU-2181)

Details are given of the design and performance of a heat interchanger suitable for transferring heat from a gas of high heat content per unit volume to one of low heat content per unit volume. The interchanger is suitable for use in large liquefiers, and a report is given of its performance in a He liquefier giving 6.5 liters of liquid He per hour. The construction is simple and involves no techniques not already available in an average laboratory workshop. A close correlation is reported between the computed and observed efficiencies and pressure drops in these interchangers. (auth)

5592
Jet Propulsion Lab., Calif. Inst. of Calif.
PROGRESS REPORT [ON] A STUDY OF THE MECHANICS OF LIQUID FILMS AS APPLIED TO FILM COOLING, by Eldon L. Knuth. Nov. 21, 1951. 16p. (JPL-PR-1-79; U22349)

The critical velocity of injection for attaching a liquid film to the inside of a circular gas duct utilizing radial injector holes was determined. Data plotted in a dimensionless form were represented as gas-stream Reynolds and Mach numbers vs. the liquid-stream Reynolds number and a modified cavitation parameter. Over a wide range of operating conditions, accurately designed radial-hole injectors appeared to be effective in introducing an adherent liquid film. The crit-

ical velocity of injection was apparently a function of system parameters; thus it may be possible to predict whether a given film-coolant stream will be attached to the wall or continue into the gas stream. (NRS abst.)

5593
Los Alamos Scientific Lab.
HEAT EXCHANGE BETWEEN A COPPER SURFACE AND LIQUID HYDROGEN AND NITROGEN, by Robert N. Mulford and Joseph P. Nigon. May 21, 1952. 7p. (LA-1416)

The rate of heat transfer from a copper surface into liquid H at 590 mm pressure has been measured for temperature differences between the surface and the liquid of 0.1 to 300°C. A maximum rate of about 5.8 ± 0.4 watts/cm^2 was found at a temperature difference between 1 and 2° for both rough and smooth surfaces. Liquid N was also investigated, and a maximum rate of about 6 watts/cm^2 at a temperature difference of 4° was found. (auth)

5594
Mechanical Engineering Research Lab., East Kilbride, Glasgow (Scotland)
HEAT TRANSFER TO MERCURY, by D. L. R. Bailey, W. F. Cope and G. G. Watson. July 1952. 32p. (NP-4010; Heat Div. Paper No. 13)

The results of measurements of heat-transfer coefficients using a parallel-flow heat exchanger with Hg as the working fluid are reported. The measurements cover the whole range of turbulent flow from the critical up to a Reynolds number of about 100,000. The measured forced convection coefficients are compared with those calculated from existing empirical formulae (McAdams, Eagle and Ferguson) and with those calculated from the momentum-transfer and vorticity-transfer theories of turbulent flow and with such other measurements as are available. In all cases the agreement is poor; the reasons for this are discussed and it is concluded that the most probable reason is that, under the conditions of these measurements, the Hg did not wet the walls of the tube. Nevertheless the results should provide data from which a Hg heat exchanger could be designed to an accuracy of ±25% for conditions under which no wetting takes place. If the Hg does wet the walls then the coefficient will be multiplied by a factor which is tentatively put at about three from a survey of all available information. This uncertainty emphasizes the urgent need for measurements under wetting conditions. (auth)

5595
Princeton Univ.
THERMODYNAMIC AND TRANSPORT PROPERTIES OF LIQUIDS. PROBLEM I. THERMAL CONDUCTIVITIES OF LIQUIDS. PROJECT SQUID (Final Report), by Ernest F. Johnson, Jr. and William J. Sheffy. Oct. 1, 1951. 7p. (NP-4025; Technical Memorandum Pr-17)

The measurement of thermal conductivities and diffusivities in pure liquids and liquid mixtures over extensive pressure and temperature ranges is considered. On the basis of experimental work and a survey of the literature, a comparison is made between a thick-disk type apparatus and a heterogeneous apparatus of concentric metal cylinders for measuring thermal diffusivities in steady and unsteady-state operation.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

5596
New Jersey Ceramic Research Station, Rutgers Univ.
TECHNICAL REPORT NO. 3; A TECHNIQUE FOR MAKING MOLYBDENUM CRUCIBLES FOR CERAMIC RESEARCH. June 15, 1952. 8p. (NP-3969; Technical Report No. 3; U22749)

Mo crucibles were fabricated by coating shaped cloth and flat tile surfaces with a Mo starch suspension to the desired thickness, drying, and firing at 2000°C in H. Surface grinding with a SiC tool produced a bright metallic polish and prevented leakage of molten ceramic materials at high temperature. (NRS abst.)

GEOLOGY AND MINERALOGY

5597
Bureau of Reclamation, Dept. of the Interior
GEOPHYSICAL INVESTIGATIONS FOR UNITED STATES ATOMIC ENERGY COMMISSION IN THE COLORADO PLATEAU AREA, by Dart Wantland. July 25, 1952. 148p. (G-119)

Geophysical field investigations using the resistivity method and the potential-drop-ratio method were made for the purpose of testing the usefulness of these geophysical procedures in connection with exploration for uranium-vanadium mineral deposits. The first phase of the tests was carried out at the Oak Springs Area on the King Tutt Mesa in Apache County, Ariz. and San Juan County, N. Mex. The second phase of the tests was performed at Bull Canyon Area in Montrose Co., Colo. Analysis of the results indicates that the potential-drop-ratio measurements showed some ability to indicate the depths to layers of clay and sandstone but it was concluded that subsurface conditions were not suitable for successful use of this technique. It was found that the resistivity method could be advantageously employed in connection with drilling in prospecting for U deposits in the local area.

5598
Lamont Geological Observatory, Columbia Univ.
U-Pb METHOD OF AGE DETERMINATION; FIRST ANNUAL REPORT AND PROJECT EXTENSION PROPOSAL, by J. Laurence Kulp. Apr. 1, 1952. 35p. (NYO-3172)

Progress is reported on studies of the reliability and accuracy of the U-Pb method for age determination of minerals and ores. Specimens were selected to represent as wide geographical, geological, and mineralogical situations as possible and were analyzed for Th and U. Analytical procedures are outlined and discussed. Preliminary investigations were made to measure quantitatively rates of Rn leakage from U minerals under laboratory conditions.

5599
Geological Survey
GRAIN SIZE DISTRIBUTION IN THE SURFACE SANDS AND THE ECONOMIC PHOSPHATE DEPOSITS OF THE LAND-PEBBLE PHOSPHATE DISTRICT, FLORIDA, by David F. Davidson. Aug. 1952. 16p. (TEM-362)

A study of grain-size and sorting data from the material in the surface sands of the land-pebble phosphate district and correlation of these data with topography indicate that better-sorted and coarser material is found on relative topographic highs, and that finer and more poorly sorted material lies in topographic lows. An apparent increase in coarseness and in degree of sorting in the sands from west to east across the district is thought to be a reflection of an increase in altitude of the ground surface. A study of data on grain size and degree of sorting of phosphatic materials from nine pits in the district shows that although the grain size and sorting of these materials differs considerably from the grain size and sorting of the surface sands, there is, nevertheless, a similar increase in grain size and degree of sorting from west to east across the district, and this increase may be attributed to the increase in altitude of the surface of the Hawthorn formation of Miocene age from west to east. It has been shown elsewhere that phosphate particle

size in the deposits of the district appears to be related to Hawthorn "topography;" coarse phosphate lies in Hawthorn "highs" and finer phosphate lies on Hawthorn "lows." Future discussions of the relation of the phosphate deposits of the district to the surface sands must take these relationships into account. (auth)

5600
RADIOACTIVITY AND RHYTHM OF SEDIMENTATION. R. Norin. Geol. Fören i Stockholm Förh. 73, 406(1951).

An abstract appeared in Brit. Ceram. Abstracts, abstr. 452(1952) and is reproduced here in its entirety.

The author has previously shown, in a study of Rhaetic-Liassic sediments of southern Sweden, a parallelism between the rhythm of sedimentation and the electrolyte concentration. These sediments are built up of clayey bituminous slates, clayey sandstones, and conglomerates, resting on Keuper marls. High concentrations of electrolytes are found in the bituminous clays resting close to the coal seams; this may indicate that the precipitation of the clays took place in a distinctly more saline medium than the precipitation of other sediments. Close agreement has now been found between the maxima of electrolyte concentration and radioactivity.

METALS AND METALLURGY

5601
Stanford Univ. School of Mineral Sciences
INVESTIGATION OF MATERIALS FOR USE IN A HEAT TRANSFER SYSTEM CONTAINING LIQUID LEAD OR BISMUTH, by Edward F. French, Ralph Parkman and O. Cutler Shepard. July 10, 1952. 24p. (AECU-2144; Report No. 13)

A program is described and results are given on the possibility of accumulating specific data which would provide absolute relations between such factors as corrosion attack, solubility, wetting, and gas content in a solid metal–liquid metal system. Stress-rupture testing is reported on Mo. Unstressed static corrosion tests of Co by liquid Pb and Bi are described. An apparatus is described for determination of O content in the bath metals. Solubility of metals in liquid Pb and Bi is discussed briefly. Wetting studies on sessile droplets of liquid Pb and Bi and the effect of temperature and oxidation on wetting are discussed. An instrument for the detection of wetting in closed, inaccessible systems where the solid metal is completely covered by liquid is reported.

5602
Institute of Engineering Research, Univ. of Calif., Berkeley
FINAL REPORT [ON] METALLURGICAL INVESTIGATION OF MATERIALS SUBJECTED TO LIQUID LEAD-BISMUTH ALLOY ENVIRONMENT, by R. C. Grassi, D. W. Bainbridge, and J. W. Harman. July 31, 1952. 78p. (AECU-2201)

Stress-rupture data have been obtained for Mo in He, in Pb, and in Bi at 1600°F. Similar information has also been determined for Nb at 1800°F. The quantitative nature of dissolution of Fe, Cr, Ni, and Mn from Sicromo 5-S, AISI-430, AISI-446, and AISI-316 has been determined for solvents of Pb and Pb-Bi of eutectic composition in the temperature range of 1400° to 2000°F. Spectrographic and micrographic procedures were employed. Limited static solution information was also obtained from Mo and Nb in Pb. A brief and concluding review of accomplishments since the inauguration of this project together with a discussion of the merit of certain extensions of these studies has been appended. (auth)

5603
Massachusetts Inst. of Tech.
STUDIES AND EXPERIMENTAL INVESTIGATIONS FOR THE DEVELOPMENT OF PHASE DIAGRAMS OF THE TITANIUM-CHROMIUM AND TITANIUM-COPPER ALLOY SYSTEMS, by Frank B. Cuff, Jr., Arnold S. Joukainen, Lee S. Richardson, and John C. Nicholls. Nov. 1951. 65p. (AF-TR-6595(pt.1))

The phase diagram of the Ti-Cr binary system has been partially completed in the range 0 to 63% Cr by using high-purity sponge Ti and electrolytic Cr. An extended solid solution in the 0 to ~45%-Cr region was found to decompose by a eutectoid reaction at a point between 14 and 15% Cr and 650 and 700°C. An intermetallic compound, $TiCr_2$, was established between 60 and 65% Cr, originating from a peritectic reaction between 1500 and 1550°C. The eutectic was placed at 55% Cr and between 1400 and 1450°C. X-ray and metallographic investigation of the Ti-Cu system indicated the presence of four compounds corresponding to Ti_2Cu, TiCu, Ti_2Cu_3 and $TiCu_4$. A eutectoid reaction was indicated between 750 and 800°C and between 7.5 and 10% Cu. A peritectic reaction at 80% Cu corresponding to $TiCu_4$ at a temperature of ~885°C appears probable as well as peritectic reaction at 66.5% Cu at ~900°C. The evidence of a eutectic at about 70 to 75% Cu and 875°C is quite conclusive. There is some evidence of two additional eutectic reactions, one at about 975°C and about 30% Cu and another between 900 and 950°C and about 50 to 55% Cu. Some slight solubility of Ti was found to exist in Cu. The solubility of Cu in the low-temperature Ti phase was determined to be less than 2.5% whereas the solubility in the high-temperature phase was between 15 and 20% at about 975°C. A procedure for analyzing the O and N content of Ti by the use of vacuum fusion is described.

5604
Notre Dame Univ.
THE TITANIUM-IRON PHASE DIAGRAM, by W. J. Fretague, C. S. Barker and E. A. Perotti. Mar. 1952. 47p. (AF-TR-6597(pt.2))

The Ti-Fe phase diagram was determined using alloys prepared in nonconsumable-electrode, inert-atmosphere arc-melting furnaces. Both DuPont Process A and iodide Ti were used in the preparation of alloys. Heat treatments were carried out under conditions that minimized contamination of the high-purity alloys. Micrographic analysis following isothermal annealing was the chief method used for phase identification of alloys of higher Ti content. Thermal, x-ray, and metallographic methods of analysis were employed on alloys of higher Fe content. A solubility of Fe in α Ti of less than 0.2% was found at the eutectoid temperature of 595°C. The eutectoid composition was placed at 14.5% Fe. The solubility of Fe in β Ti was determined to be 25% Fe at the eutectic temperature of 1085 ± 3°C. The existence of two intermediate phases corresponding to the compositions TiFe and $TiFe_2$ was confirmed. The existence of the intermediate phase Ti_2Fe and the decomposition of TiFe to Ti_2Fe and $TiFe_2$ was disproved. A eutectic between β Ti and TiFe was determined at 32.0 ± 0.2% Fe at a temperature of 1085 ± 3°C. A peritectic reaction for TiFe was determined at approximately 53.0% Fe at a temperature of 1317°C. The extrapolated melting point of $TiFe_2$ was approximated as 1520°C. (auth)

5605
Metallurgical Labs., Dow Chemical Co.
10TH QUARTERLY REPORT [FOR] MARCH 1, 1952 - MAY 31, 1952 [ON] PREPARATION OF HIGH PURITY MAGNESIUM AND A STUDY OF THE EFFECT OF NON-METALLIC AND ALKALI METAL IMPURITIES ON THE CORROSION CHARACTERISTICS OF PURE MAGNESIUM. [nd] 31p. (COO-94)

Continued studies of Mg-Fe alloys have substantiated the existence of an Fe tolerance limit at 60 ppm Fe for the slowly cooled alloys. Further studies of this alloy system revealed that thermal history can have a considerable effect (25% variation) upon the spectrographic analysis of Fe. Investigation of the Mg-Fe-nonmetallic ternary systems in-

dicates that Si is detrimental to the corrosion properties of alloys containing Fe below the tolerance limit and beneficial in alloys containing Fe above the tolerance limit. S has no effect on the salt-water corrosion resistance of pure Mg or Mg-Fe alloys. Both carbon and chlorides yielded erratic corrosion results in Mg-Fe alloys. The physical state of high-purity Mg (machined, annealed, or etched) has no significant effect upon the corrosion properties. (auth)

5606

Armour Research Foundation

RESEARCH AND DEVELOPMENT TOWARD IMPROVING TITANIUM-ALUMINUM BINARY ALLOYS BY THE ADDITION OF A THIRD COMPONENT; INTERIM TECHNICAL REPORT NO. 2 FOR JANUARY 1–APRIL 30, 1952. [nd] 35p. (NP-3973)

A study was made of the addition of other elements to binary Ti-Al alloys to produce alloys superior to those now available, both in strength and toughness. Al-Cr-Ti alloys and Al-Mo-Ti alloys were studied in detail as examples of two types of Ti-Al ternary alloys which would be expected to respond to widely differing heat-treating procedures. Theoretical aspects for the selection of Cr and Mo additions to the Ti-Al base composition are reported.

5607

Massachusetts Inst. of Tech.

THE CONSTITUTION OF TITANIUM-TANTALUM-CARBON ALLOYS; TECHNICAL REPORT NO. 4, by John G. McMullin. June 10, 1952. 47p. (NP-3981; Technical Report No. 4; U22922)

An 1820°C isothermal cross section of the Ti-Ta-C ternary diagram was prepared from x-ray diffraction and metallographic data. The 60 alloys investigated were prepared by vacuum sintering of pressed powder compacts of C and the hydrides of Ti and Ta. No phases other than those appearing in the three binary diagrams were observed. TiC and TaC formed a continuous series of solid solutions with a range of 50 to 40 at. % C on the TaC side, widening to 48 to 22 at. % C on the TiC side. At temperatures above the Ti transition temperature, Ti and Ta formed a complete series of solid solutions containing up to 2 at. % C. Ta_2C contained about 31.5 at. % C with no appreciable range of C content and no solubility for Ti. A large three-phase area appearing in the diagram contained Ta_2C in equilibrium with the carbide phase (50 at. % Ti, 21 at. % Ta, 29 at. % C) and the metal phase (38 at. Z Ti, 60 at. % Ta, and 2 at. % C). The only ternary reaction in the system was a 2-over-2 reaction (carbide phase + metal phase → Ta_2C + liquid); the reaction occurred at a temperature of 2025°C. (auth)

5608

Fansteel Metallurgical Corp.

INTERIM TECHNICAL PROGRESS REPORT [ON] DEVELOPMENT OF A PROTECTIVE COATING FOR TITANIUM ALLOYS FOR PERIOD FEBRUARY 29, 1952 THRU JUNE 30, 1952, by Stanley Kluz, Caesar Kalinowski, and Ralph Wehrmann. [nd] 5p. (NP-3990; Report 401/51-11)

A large number of Si-coated Ti strips were prepared by sintering at 1000°C in a He atmosphere. The coatings obtained by using Si metal were thin and did not adhere well. A higher sintering temperature is recommended. Coatings using the silicide 57% Ni-43% Si were very rough and quite brittle. Coatings of 50% Al-50% Si silicide were good, especially if two applications were made. When a layer of Si was first applied, and then a layer of 50% Al-50% Si, a still better coating was obtained. Several of the specimens were oxidation tested in air at 800°C. The data on sintering and testing are tabulated.

5609

New York Univ.

THE QUENCH HARDENING OF TITANIUM-MANGANESE ALLOYS, by Y. C. Liu. Jan. 25, 1952. 26p. (NP-3997; WAL-401/88-6; Interim Technical Report No. 1)

A critical review of the literature has been made in order to determine the nature of the quench-hardening reaction in Ti-Mn alloys. Evaluation of the reaction is made on the basis of (a) consideration of alloy systems showing a similar crystallographic transformation (b.c.c. to c.p.h.), and (b) consideration of systems showing similarity in phase diagrams to the Ti-Mn diagram. From the evidence presented, the quenching transformation is believed to be of the martensitic type. The unstable α' formed on quenching, probably with a c.p.h. structure, may be responsible for the quench-hardening phenomenon in the Ti-Mn alloys. The following figures are presented: graph showing effect of heat-treatment on various Mn alloys; isothermal transformation study of Ti-Mn alloys; Ti-rich portion of the tentative Ti-Mn equilibrium diagram; Cu-rich portion of the Cu-Al equilibrium diagram; Fe-rich portion of the Fe-Ni equilibrium diagram; Fe-rich portion of the Fe-Mn equilibrium diagram; and Ti-rich portion of the Ti-Mo equilibrium diagram. 26 references.

5610

General Electric Research Lab.

DEVELOPMENT OF ZIRCONIUM BASE ALLOYS; ELEVENTH QUARTERLY REPORT (PROGRESS REPORT NUMBER 12), by J. H. Keeler. July 5, 1952. 30p. (SO-2506; Progress Report No. 12; RL-714)

Transformation, deformation, and recrystallization textures for rolled crystal-bar Zr were determined. Evaluation of the improved arc-melting process was carried out. Tensile properties of crystal-bar Zr and of binary alloys of Zr containing Cr, Al, or Ta were determined in the temperature range from 200° to 370°C. The temperature dependence of the rate sensitivity of severely cold-reduced and of annealed crystal bar was also studied.

5611

THE EXTRA ELECTRICAL RESISTANCE DUE TO COLD WORK AND NEUTRON IRRADIATION OF PLATINUM. R. A. Dugdale. Phil. Mag. (7) 43, 912-14(1952) Aug.

The decay of the extra resistance of two pile-irradiated and one cold-worked resistor of Pt (each of about 1 Ω) has been followed part of the way during heating of the resistors first to 70°C for 640 hr, and subsequently to 90°C for 336 hr. The resistance was measured at intervals to an accuracy of 1 part in 10^4, after cooling to the triple point of water. During the two annealing periods ~13% of the extra resistance of the cold-worked resistor and of one irradiated resistor and ~17% of the extra resistance of the other irradiated resistor disappeared. All the resistance-decay curves could be fitted to an empirical formula of the type $r = A - B \log_{10} (t + \gamma)$, where r is the extra resistance, and A, B, and γ are constants at constant temperature. The agreement in the activation energy for the three resistors and the general similarity in shape of the annealing curves suggest that the same processes are responsible for the decrease of resistance in the two cases. This supports the idea that the increased resistance due to cold work is at least in part due to the creation of lattice vacancies and perhaps interstitial atoms.

5612

A NEW CALCULATION OF SOME PROPERTIES OF METALLIC BERYLLIUM. B. Donovan. Phil. Mag. (7) 43, 868-74(1952) Aug.

A quantum-mechanical calculation of the lattice constant, compressibility, cohesive energy, and work function of metallic beryllium is carried out, using an extension of the cellular method of Wigner and Seitz. Wave functions and energies corresponding to the lowest electronic state in the

metal are obtained by numerical integration of the Schroedinger equation, and the ion-core field used is of the Hartree type. The Fermi energy is evaluated by determining the effective electronic mass according to the method devised by Bardeen. Free-electron values are used for the exchange and correlation energies; it is pointed out that the corrections to these two terms may tend to cancel each other. The energy of the valence electrons in the free atom is obtained from the calculations of Hartree, together with the correlation energy. With the exception of the work function, the final results agree very satisfactorily with experiment and compare favorably with the values obtained by more elaborate methods. (auth)

TRACER APPLICATIONS

5613

Atomic Energy Research Establishment, Harwell, Berks (England)

RADIOACTIVE ISOTOPES IN MINERAL DRESSING RESEARCH, by J. S. Carr. May 1, 1952. 30p. (AERE CE/R-912)

The function of mineral dressing and the part played by radioactive isotopes in related research is briefly introduced. Certain aspects of radioactivity, namely detection and general features of the use of radioactive isotopes pertinent to the applications considered, are discussed. The applications of radioactive isotopes to flotation research studies are considered in terms of adsorption phenomena at gas-liquid and solid-liquid interfaces. The equilibria existing at the mineral-liquid interface are discussed in order of increasing complexity, starting with a mineral in water and finishing with a mineral in a solution containing collector and other ions either activating or depressing. The experimental techniques relating to these studies which are discussed include preparation of the minerals used, equilibration procedures adopted and radiochemical measurements required. Other applications in the field of mineral dressing which are considered concern studies of minerals per se, comminution, mechanical concentration and of fuel technology. Radioactive isotopes suitable for mineral dressing investigations and radioactive compounds suitable for mineral dressing research are tabulated. 99 references. (auth)

PHYSICS

5614

Ohio State Univ.

SUPERCONDUCTIVITY OF RHENIUM, by J. G. Daunt and T. S. Smith. [nd] 19p. (AECU-2182)

Measurements have been made in the liquid-He temperature region of the magnetic threshold curve of Re by observations of the magnetic moment of a powdered sample. The transition temperature, T_c, in zero magnetic field was found to be 2.42°K, and the observed slope of the threshold curve at $T = T_c$ was 235 gauss/°K. Assuming a reversible transition, the value of the normal electronic specific heat coefficient γ obtained from the magnetic data is 4.6×10^{-4} cal/mole/°K^2, a value which would be expected from the correlation between γ/ν and T_c previously proposed. (auth)

5615

Atomic Energy Research Establishment, Harwell, Berks (England)

A STUDY OF THE MOTION OF SOLID PARTICLES IN A HYDRAULIC CYCLONE, by D. F. Kelsall. Apr. 21, 1952. 34p. (AERE-CE/R-913)

Using an optical method involving suitable ultramicroscope illumination and a microscope fitted with rotating objectives, tangential velocity components of fine aluminium particles were measured directly at selected positions within a transparent hydraulic cyclone. Vertical velocity components at the same positions were obtained by measuring the angle of inclination of particle tracks to the horizontal and water radial velocity components were calculated from continuity considerations. The results are presented as tangential, vertical and radial velocity profiles from which a picture of the flow patterns can be obtained. By applying Stokes' Law to the settling process, equilibrium envelopes were derived for particles of several sizes and a measure of the particle separation efficiency was obtained.

5616

CHARGE TRANSFER FOR PROTONS IN HELIUM. R. H. Garstang. Phys. Rev. 87, 529-30(1952) Aug. 1.

The total cross section for the capture of an electron from a He atom by a low-velocity proton has been calculated for the case of capture from the ground state of He into the 2s state of H. The method of perturbed stationary states used by Massey and Smith (Proc. Roy. Soc. (London) A142, 142(1933)) for capture into the 1s state was used. The final results are plotted. The cross section is much smaller for capture into the 2s state of H than into the 1s; the activation energy of ~800 volts for the 2s state is ~8 times that for the 1s.

5617

LOW TEMPERATURE PHYSICS. F. E. Simon, N. Kurti, J. F. Allen, and K. Mendelssohn. London, Pergamon Press Ltd., 1952. 132p.

A review of this book appeared in Phil. Mag. (7) 43, 914 (1952) Aug. and is reproduced here in part.

The four lectures which are reported in this volume are by Professor F. E. Simon (A General Survey), Dr. N. Kurti (The Temperature Range below 1°K), Professor J. F. Allen (Liquid Helium), and Dr. K. Mendelssohn (Superconductivity). The course was given at the Royal Institution in March 1950, but the version for the press contains references to work done as recently as a few months ago.

5618

SECOND SOUND IN $He^3 - He^4$ MIXTURES. P. J. Price. Phys. Rev. 87, 381(1952) July 15.

The hydrodynamics of superfluid mixtures of He^3 and He^4 has been worked out on the assumptions that the two-fluid dynamics still applies and that the He^3 atoms have the average velocity v_n, i.e., move entirely with the normal fluid. The mixture evidently behaves in the temperature range 1.3 to 1.6°K as though five He^4 atoms were "condensed" on each He^3 atom and the rest of the liquid were unaffected.

5619

HEAT CONDUCTION IN HELIUM II CONTAINING SOME ^{3}HELIUM. J. J. M. Beenakker, K. W. Taconis, E. A. Lynton, Z. Dokoupil, and G. Van Soest. Physica 18, 433-48 (1952) June-July. (In English)

A directed heat current in a reservoir containing a He^3-He^4 mixture below the λ point drives the He^3 toward that part of the reservoir which is artificially kept cold. The quasi-osmotic pressure due to this concentration gradient must in equilibrium be balanced by a fountain pressure caused by an appropriate temperature gradient. Thus a difference in He^3 concentration, X, across the reservoir gives rise to a difference in temperature, according to the equation

$$-RT\rho\,\Delta X = f\,\Delta T.$$

This temperature difference is equivalent to a resistance to the heat current, so that He II containing some He^3 does not

have the virtually infinite heat conductivity of He II containing only He^4. The heat resistances have been measured as a function of the heat current for various concentrations of He^3. It was found to be proportional to the He^3 concentration. By combining the above equation with the diffusion equation

$$D(dX/dz) + v_n X = 0,$$

one can calculate from the heat resistance and the known He^3 concentration the diffusion constant D. This was found to be independent of He^3 concentration, and, at lower temperatures, in good agreement with the values calculated by applying a gas model to the normal component of He II. The method of this experiment can be used to determine He^3 concentrations down to about 5×10^{-5} with a relative error of less than 5%. (auth)

5620
THE SPECIFIC HEATS OF SEVERAL METALS BETWEEN 1.8° AND 4.2°K. I. Estermann, S. A. Friedberg, and J. E. Goldman. Phys. Rev. 87, 582-8(1952) Aug. 15.

The specific heats of magnesium, titanium, zirconium, and chromium have been measured between 1.8° and 4.2°K by the vacuum-calorimeter method. In each case it has been possible to represent the results by an expression containing an electronic term linear in the temperature and a lattice term cubic in the temperature. The electronic contribution to the specific heats of these metals is in reasonable agreement with expectations based on the Sommerfeld theory and, in particular, with the results of more recent detailed calculations of energy bands in transition metals. This work has been facilitated by the development of a sensitive semiconducting resistance thermometer of germanium-indium alloy for use at liquid-helium temperatures. (auth)

5621
THE BINDING ENERGY OF THE THOMAS-FERMI ATOM. J. M. C. Scott. Phil. Mag. (7) 43, 859-67(1952) Aug.

The Thomas-Fermi statistical model of the atom leads to the formula $20.92\ Z^{7/3}$ ev for the total binding energy of an atom with atomic number Z, but this formula gives values which are too high by roughly 20%. The actual binding energies increase quite smoothly with increasing Z, which suggests the existence of a more appropriate formula. The reasons for the discrepancy are explained and a new theoretical formula derived. This is compared with spectroscopic and self-consistent field data and is found to agree within 1 or 2%. Some uncertainty remains about the relativistic correction for heavy atoms. (auth)

5622
THE ELECTRICAL RESISTANCE OF MAGNESIUM, ALUMINIUM, MOLYBDENUM, COBALT AND TUNGSTEN AT LOW TEMPERATURES. J. G. Thomas and E. Mendoza. Phil. Mag. (7) 43, 900-10(1952) Aug.

This paper describes further results concerning the minimum of electrical resistance of metals at low temperatures. Some magnesium wires, known to contain 0.01 atomic per cent of iron, exhibited definite minima; the magnetoresistance and the susceptibility were, however, independent of temperature. It therefore appears that though the minimum in zero field may well be an effect due to the presence of impurity atoms, the mechanism is not that of scattering of conduction electrons by unfilled electronic d-shells in these impurity atoms. Measurements on a dilute alloy of manganese in aluminum confirmed the filling of the d-shells of the transition metal by the multivalent solvent. The resistance of each of several samples of molybdenum went through a minimum rising to a constant value below about 0.1°K. A superconducting impurity ($T_c \simeq 0.4$°K, $H_0 \simeq 30$ gauss), unidentified but probably a compound, could be produced by annealing. Samples of cobalt (hexagonal close-packed with traces of face-centered cubic) and tungsten showed no anomalies or superconductivity down to the region of 0.06°K. (auth)

5623
ENTROPY AND SPECIFIC HEAT OF LIQUID He^3. K. S. Singwi. Phys. Rev. 87, 540-1(1952) Aug. 1.

The exact formulas for the entropy and specific heat of a system of particles obeying Fermi-Dirac statistics are given and used to calculate the entropy and specific heat of liquid He^3 at various temperatures. The entropy curve lies very close to the experimental curve (Abraham, Osborne, and Weinstock, Phys. Rev. 80, 366(1950)) from 1° to 2.5°K. No experimental data are available below 1°K. The experimental curve, however, shows a strong tendency to approach a constant value as $T \to 0$. An attempt is made to account for this excess entropy on the basis of a λ transition at 1°K and a characteristic temperature θ of 4.3°K.

COSMIC RADIATION

5624
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
THE HARD COMPONENT OF COSMIC RAYS IN THE UPPER ATMOSPHERE, by Malcolm A. Clark. June 1, 1952. 101p. (NP-3953; Technical Report No. 59; U22726)

A shortened version of this report appeared in Phys. Rev. 87, 87-90(1952) and was abstracted in Nuclear Science Abstracts as NSA 6-5130.

5625
AN UNUSUAL MESON-INDUCED STAR. W. F. Fry and J. J. Lord. Phys. Rev. 87, 533-4(1952) Aug. 1.

An event which is interpreted as a heavy-meson-induced star has been observed in an Ilford G5 400-μ plate exposed for ten hours above 90,000 feet by means of a "skyhook" balloon. The gap density, δ rays, and multiple scattering along one of the tracks indicate that it was probably a negative τ or κ meson traveling toward the star. The other tracks are interpreted as follows: a π meson with kinetic energy of the order of rest energy; a π meson of energy ~15 Mev; and a proton or possibly a deuteron. The total kinetic energy of all the charged particles observed plus the rest energy of the two mesons is less than the rest energy of a τ or κ meson. It is concluded that the event is an example of the nuclear capture of a negative τ or κ meson where two mesons and one heavy particle are ejected plus one or more neutral particles and possibly a recoil or low-energy electron.

5626
A NARROW ANGLE PAIR OF PARTICLES PRODUCED IN HYDROGEN. A. B. Weaver, Earl A. Long, and Marcel Schein. Phys. Rev. 87, 531(1952) Aug. 1.

Report is made of an unusual event observed in a cloud-chamber study of interactions of cosmic particles in liquid H_2 at sea level. Two tracks, A and B, at minimum ionization apparently originated at a point in the hydrogen 21 cm above the visible part of the chamber. The angle between tracks A and B is 4.3 ± 0.8°. Measurements on A indicate very little scattering (~0.3°) in the 2-cm Pb plate in the cloud chamber; this corresponds to a momentum of 6×10^9 ev/c. A third track meets A at a point in the glass of the chamber, and it can be interpreted as a knock-on electron stopping in the lead plate. B is scattered in the Pb-plate through a projected angle of 5.4 ± 0.2°. Possible interpretations of the event are suggested.

5627
CLOUD CHAMBER PHOTOGRAPHS OF THE COSMIC RADIATION. G. D. Rochester and J. G. Wilson. London, Pergamon Press Ltd., 1952. 128p.

A review of this book appeared in Phil. Mag. (7) 43, 914 (1952) Aug. and is reproduced here in part.

An atlas of cloud-chamber photographs of various phenomena associated with cosmic rays is presented. The photographs are collected from laboratories throughout the world, and include a large number that have not been published hitherto. With each photograph there are captions which explain the main features of the event and also stress any doubt there may be of the correctness of the interpretation put forward. The first section is devoted to technical features of operation. In the remaining sections the photographs show a wide variety of cosmic-ray phenomena ranging from electron cascades to V particles.

5628
THE DECAY SCHEME OF THE V^0-PARTICLE. K. A. Brueckner and R. W. Thompson. Phys. Rev. 87, 390-1 (1952) July 15.

The possibility of V^0 decay according to the scheme $V^0 \rightarrow p + n_0 + \pi^- + Q$, where n_0 is a neutral decay product, is considered. Three tests are discussed for the presence of a neutral particle. The tests are concerned with the probability distributions of observed apparent energy release Q^*, coplanarity of decay products, and the net transverse momentum of the charged particles relative to the true direction of the V^0 and in the plane of the charged particles. The theoretical probability distributions for the cases in which the neutral particle is a π^0 meson or a particle of zero mass are shown.

5629
HIGH ENERGY NUCLEAR COLLISIONS AND THE FERMI MODEL. H. Messel and H. S. Green. Phys. Rev. 87, 378(1952) July 15.

Consideration is given to the question of correlating the differential cross sections for inelastic nucleon-nucleon collisions with experimental data on the angular and radial spread of the nucleon component of the cosmic radiation. The results of Hazen et al. (Phys. Rev. 86, 198(1952)) and the present authors indicate that neither the quasiisotropic distribution nor the Fermi distribution can even approximately describe the facts and that some unknown process is in operation at very high energies which results in an intense concentration of the particles scattered in nuclear collisions in the forward and backward directions.

5630
ON THE POSSIBLE RELATION OF GALACTIC RADIO NOISE TO COSMIC RAYS. G. W. Hutchinson. Phil. Mag. (7) 43, 847-52(1952) Aug.

The possibility is considered that cosmic rays are accelerated in regions of the galaxy of intermediate particle density ($\approx 10^3$ cm^{-3}). It is found that a conservative estimate of the magnetic fields in such regions would lead to a radio noise flux of the observed order of magnitude, and that the observed spectrum could easily be produced. A possible cause is suggested for the low-energy cutoff in the cosmic-ray spectrum. If the proposed mechanism accounts for any large proportion of the cosmic rays, these should be accompanied by a small flux of γ quanta which should show the same anisotropy as the galactic radio noise. (auth)

5631
AZIMUTHAL VARIATION OF COSMIC RADIATION FOR ZENITH ANGLE 40° AT λ = 19 N. B. Bhowmik and G. S. Bajwa. Phys. Rev. 87, 530-1(1952) Aug. 1.

The azimuthal variation of cosmic-ray intensity has been measured at Delhi with four identical triple-coincidence telescopes of angular resolution 10° × 20°. The telescopes were kept at 40° zenith angle, the azimuthal angle of the cone of the telescope being 10°. The results obtained from observations recorded during the period December 1951 to April 1952 are reported. The mean curve of the four telescopes shows a comparatively sharp minimum in the east and a broad maximum in the west. The east-west difference is maximum along the 75°-255° line in accordance with predictions of Lemaitre and Vallarta. The azimuthal variation is remarkably smooth in the eastern sky, while in the western azimuth there are quite a few humps which are due to the penumbral effect. The primary energy spectrum has been assumed to be $F(E)dE = (K/E^c)dE$ and the exponent has been computed as c = 1.45.

ELECTRONS

5632
FURTHER ASPECTS OF THE TRIDENT PROCESS. J. E. Hooper, D. T. King, and A. H. Morrish. Phil. Mag. (7) 43, 853-8(1952) Aug.

The division of energy between the secondary particles in the direct production of electron pairs by fast electrons is discussed, and experimental results are compared with the Bhabha theory. The angular separations of the tracks of the secondary particles are considered. An event attributed to pair production by a fast meson is described. (auth)

INSTRUMENTS

5633
Argonne National Lab.
THE THEORY OF MECHANICAL ELECTROMETERS, by Raymond J. Munick. July 1952. 18p. (AECU-2198; UAC-600)

The theory of a generalized mechanical electrometer is developed in terms of the direct capacitances and potential differences between each pair of conductors comprising the electrometer, regardless of which is the movable conductor. A criterion is established for stable static equilibrium of the movable conductor. A distinction is made between voltage and charge measurements. General expressions are obtained for voltage and charge sensitivities, period, and magnitude of random fluctuations in position of the movable conductor. (auth)

5634
Knolls Atomic Power Lab.
A SPIRAL-SCANNING X-RAY REFLECTION GONIOMETER FOR THE RAPID DETERMINATION OF PREFERRED ORIENTATIONS, by A. N. Holden. [nd] 9p. (AECU-2200)

A spiral-scanning goniometer is essentially a continuously driven Schultz-type goniometer, but with a definite movement synchronized with the movement of the rate recorder. With this spiral-scanning goniometer and the standard counting circuit, rate meter, and recorder supplied with the General Electric Spectrogoniometer, good qualitative data on the preferred orientations of the (220) and (222) planes in cube-textured Cu have been obtained in 21 min for each type plane. Information on the preferred orientation in α U has been obtained in 84 min per plane type. The goniometer is designed to move a specimen in such a fashion that all the planes within that specimen whose normals would trace a spiral path in a stereographic projection are brought sequentially into reflecting position. This movement is accomplished by linking the drive of both circles of the goniometer through a cam and follower nut system.

5635
National Bureau of Standards
DAMPING OF ELASTICALLY SUPPORTED ELEMENT IN A VACUUM TUBE, by Samuel Levy, Edward V. Hobbs, Wilhelmina D. Kroll and Leonard Mordfin. June 1952. 15p. (NBS-1707)

It is shown that it is possible to damp the motion of an element in a vacuum tube by making the tube part of a two-degree-of-freedom system. The equations of motion of this system are presented. The optimum values of the parameters are determined on SEAC, the Bureau of Standards elec-

tronic automatic computer, for a particular set of design requirements. In carrying out this computation, SEAC is used not only to compute the responses of the system for given values of the parameters, but also to choose that set of parameters for which the performance is optimum. A description is given of a tube mount built in accordance with the computations and of the degree of damping achieved. (auth)

5636
Radiation Lab., Univ. of Calif., Berkeley
DESIGN OF A TRIGGERED GAP, by Leonard E. Gibson and Mark Harris, II. July 15, 1952. 21p. (UCRL-1895)

Work is outlined on the development of a triggered spark gap having low inductance and high current carrying capacity with a minimum variation in the time delay after the start of the trigger pulse. Fabrication drawings for the ball gap electrodes and spacer are given.

ISOTOPES

5637
ISOTOPES OF NICKEL. A. R. Brosi. Ind. Eng. Chem. 44, 955-6(1952) May.

Following a brief review of the general types of application of isotopic techniques to chemical problems, the properties of the individual Ni isotopes are described in so far as they affect the feasibility of applying isotopic techniques to problems in Ni chemistry. Finally, examples are given of the use of Ni isotopes in chemical studies which have been reported in recent publications.

ISOTOPE SEPARATION

5638
A NEW METHOD FOR ENRICHMENT OF ISOTOPES IN THE TRANSITION REGION BETWEEN KNUDSEN AND POISEUILLE FLOWS. H. D. Beckey and W. E. Groth. Z. Naturforsch. a7, 474-80(1952) July. (In German)

A previously unknown separation effect for gaseous isotopes has been found in the transition region between Knudsen and Poiseuille flows. When two vessels are connected by a capillary, which has a diameter $\simeq \lambda/s$ (mean free path of the gas mixture/capillary cross section) and is cooled on one end and heated on the other, the lighter component concentrates at the cold end and the heavier at the warm end of the capillary ("negative effect"). Pressure and time dependence of this effect was studied in H_2-D_2 and He-Ne mixtures. The sign of the effect was reversed ("positive effect") in the pressure region of pure Knudsen flow by modifying the experimental apparatus to include a countercurrent tube with Poiseuille flow. The negative effect was found to arise from the fact that the forward migration due to concentration gradient caused by the change in mean free path along the capillary was less separative than the backward migration caused by the temperature gradient.

MEASURING INSTRUMENTS AND TECHNIQUES

5639
Argonne National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY REPORT FOR MARCH, APRIL AND MAY, 1952. [nd] 21p. (ANL-4828)

Progress of the work is presented on the average energy to make an ion pair in various gases by α particles from Po, investigation of the dependence of scintillation efficiency upon fluor concentration in several polystyrene solid solutions, operation of a gas-filled proportional counter x-ray spectrometer, analysis of transient and polarity effects on cylindrical U-fission chambers, design of a cylindrical differential ion chamber, x-ray tube pulser and scintillation detector, measurement of the decay time of scintillation materials, and design of an apparatus for measuring the resistance of insulators.

5640
Brookhaven National Lab.
THE AREA SURVEY MANUAL OF BROOKHAVEN NATIONAL LABORATORY; AREA RADIATION DETECTION INSTRUMENTATION, MAINTENANCE, AND RESULTS, by Max M. Weiss. Jan. 1, 1952. 151p. (BNL-167)

A description of the instrumentation for the area radiation monitoring stations established near the Brookhaven National Laboratory is presented. The report also serves as an instruction manual for the operation and maintenance of these stations.

5641
Naval Research Lab.
PULSED GEIGER TUBE OPERATION, by S. W. Lichtman. July 25, 1952. 17p. (NRL-4013)

Operation of a Geiger tube from a periodic pulse voltage furnishes a means for extending its range of intensity measurement beyond the limits normally encountered with d-c operation. The periodic pulse may either augment the d-c Geiger region voltage or it may serve as the sole exciting potential for the counter tube. In either event, the range will be extended in proportion with the factor t_d/w, where t_d is the counter-tube dead time and w is the injected pulse width. For triggered operation at high overvoltages, involving large ratios of t_d/w, a region exists in which the charge-per-count pulse is maximized and the counter-tube current becomes substantially independent of the operating voltage. Either linear or nonlinear radiation detection may be attained by measurement of an appropriate counter circuit parameter and by suitable shaping of the triggering pulse. (NRL abst.)

5642
A NEW PHOTOGRAPHIC METHOD FOR NEUTRON VELOCITY SPECTROGRAPHY. II. P. M. Endt and C. H. Paris. Physica 18, 387-98(1952) June-July. (In English)

In a previous paper (see NSA 5-3995) the principles of a new and simple method for neutron-velocity spectrography were presented. In this second paper a more elaborate description of the apparatus is given and some simple experiments to test its performance are described. (auth)

5643
ANGULAR DISTRIBUTIONS OF CHARGED PARTICLES FROM NUCLEAR REACTIONS. P. M. Endt, D. De Jong, M. Bogaardt, and B. Koudijs. Physica 18, 399-406(1952) June-July. (In English)

A description is given of equipment built for the measurement of angular distributions of charged particles released in nuclear reactions. Thin targets are bombarded by deuterons or protons accelerated by a cascade generator and analyzed by a magnet. Secondary particles from the target are detected by means of photographic emulsions placed at 15° intervals round the target. Results obtained with specific reactions, e.g., $Be^9(d,p)Be^{10}$ and $C^{13}(d,p)C^{14}$, will be dealt with in separate papers. (auth)

5644
LINE SHAPE OF MONOCHROMATIC γ-RAYS IN THE SCINTILLATION SPECTROMETER. D. Maeder and V. Wintersteiger. Phys. Rev. 87, 537-8(1952) Aug. 1.

In order to facilitate quantitative analysis of complex or continuous γ spectra by means of the NaI scintillation technique, the detailed line shape for monochromatic γ rays is calculated. The shape will always lie between the extreme cases of primary effect, where contributions from the absorption of secondary quanta may be neglected, and complete secondary absorption. The extreme assumptions are applied to the treatment of secondary quanta, and limits are obtained for the secondary contributions. Upper and lower limits for the modified photopeaks and compton dis-

tribution are obtained and then used in the treatment of secondary absorption to lead to higher-order approximations which converge to the true line shape. The curves for $\gamma = 1$ (in mc^2 units) are shown for several crystal sizes. The effect of a lucite light pipe extending from behind the crystal to infinity is also indicated.

5645
GAMMA- AND ALPHA-PRODUCED SCINTILLATIONS IN CESIUM FLUORIDE. W. Van Sciver and R. Hofstadter. Phys. Rev. 87, 522(1952) Aug. 1.

Small anhydrous CsF crystals have been grown in a H_2 atmosphere without the addition of Tl or other activators. These crystals scintillate with light output predominately in the blue-ultraviolet region. The total integrated pulse height for Co^{60} γ rays is between 1/10 and 1/13 that of anthracene when an ultraviolet-sensitive C7140A photomultiplier is used, whereas the CsF pulse height is 1/20 the anthracene pulse when a 5819 photomultiplier is used. The response to γ radiation is approximately proportional to energy. Pulses produced by 5.3-Mev α particles are about the same size as those caused by 1.3-Mev γ rays. The decay constant of pulses produced by Co^{60} γ radiation is $5 \pm 1 \times 10^{-9}$ sec; the α-pulse decay constant is $\sim 2 \times 10^{-7}$ sec.

5646
MEASUREMENT OF SHORT BETA-DECAY LIFETIMES. R. B. Holt, R. N. Thorn, and R. W. Waniek. Phys. Rev. 87, 378-9(1952) July 15.

A new method is described for measuring the lifetimes of isotopes produced in the bombardment of targets by the internal proton beam of a cyclotron. The decay particles are detected by a crystal, lucite probe, and photomultiplier arrangement. The β particles from Li^8 were detected directly by this method, and a half life of 170 ± 5 msec was determined for Li^8. The spallation reaction leading to Li^8 is $C^{12}(p,4p)Li^8$, with a threshold energy of about 47.5 Mev in the laboratory system.

5647
INTERNAL ABSORPTION OF FLUORESCENT LIGHT IN LARGE PLASTIC SCINTILLATORS. C. N. Chou. Phys. Rev. 87, 376-7(1952) July 15.

Preparation of plastic scintillators of large dimensions by impregnating styrene monomer with various fluorescent substances before polymerization is reported. The pulse sizes were observed in an oscilloscope from the output of a 5819 photomultiplier attached to one end of the rod. A narrow beam of γ rays from a Co^{60} source passed through the rod perpendicularly to its axis at various distances from the surface of the photomultiplier. The pulse sizes observed with anthracene in polystyrene, p-terphenyl in polystyrene, and phenylcyclohexane solution are tabulated. A plastic scintillator consisting of 3% anthracene in polystyrene, 4.1 cm in diameter and 30 cm long, showed relatively small absorption (less than 15%) of the light output throughout its whole length.

5648
USE OF A SPARK COUNTER FOR THE STUDY OF URANIUM FISSION. Pierre Savel. Compt. rend. 235, 156-7(1952) July 16. (In French)

A spark counter was used to detect the thermal-neutron fission of natural U. The electrode-voltage threshold for fission-fragment detection was 350 v lower than for detection of α particles. For a neutron flux of 7500 ± 300 neutrons/sec/cm^2 a maximum of 14 cpm was observed. Such a counter placed in the Châtillon pile would detect fissions having cross sections of the order of 10^{-30} cm^2.

MESONS

5649
Rochester Univ.
MESON-NUCLEON SCATTERING AND THE CLASSICAL STRONG-COUPLING THEORY, by David Feldman. Aug. 1, 1952. 9p. (NYO-3220)

The qualitative features of meson-nucleon scattering which result from a classical treatment of the charge-symmetric pseudoscalar field are investigated. The differential cross sections for ordinary scattering ($\pi^+ + p \rightarrow \pi^+ + p$ and $\pi^+ + n \rightarrow \pi^+ + n$) and for charge-exchange scattering ($\pi^+ + n \rightarrow \pi^0 + p$) are found to have a resonance where meson energy ν is approximately equal to the spacing ν_0 between isobaric states; the width of the resonance is precisely that found by Marshak for the corresponding metastable nucleon state with excitation energy ν_0 in the classical treatment of the neutral pseudoscalar field. Qualitative correspondence is found between the classical and quantum-mechanical strong-coupling theories for the ratio $\sigma_{ord}/\sigma_{exch}$ and the angular distributions for both ordinary and exchange scattering. Rough comparison with experimental cross sections shows that while the energy variation of σ_{ord} and σ_{exch} is reasonably well given by the theory (except in the low-energy region where the S-wave scattering is predominant), the absolute magnitudes of the cross sections are uniformly too small by a factor of 2. In conclusion it is emphasized that although qualitative agreement with experiment was obtained in terms of classical strong-coupling, evidence for the existence of nucleon isobars is not conclusive.

5650
Rochester Univ.
X-RAYS FROM MESIC ATOMS, by M. Camac, A. D. McGuire, J. B. Platt and H. J. Schulte. Aug. 14, 1952. 6p. (NYO-3222)

Direct evidence has been obtained for formation of π-mesic atoms. A calculation of the expected energy levels was made by assuming a simple coulomb potential and a pion mass of 276 m_e; the 2p-1s transition should give quantum energies of 100 kev in C, 178 kev in O, and 44.3 kev in Be. A search was then made for such x rays in coincidence with the stopping of π-mesons in these elements. The x-ray detector consisted of a disk of NaI(Tl) and a 5819 photomultiplier. 0.55 g/cm of Pb or Al could be inserted between the stopper and the x-ray detector without disturbing the geometry. Representative pulse-height spectra are shown. In all three elements x rays were observed at the expected energies within the limits of the energy calibration. In C the number of x rays emitted per stopped pion is 0.13 ± 0.03. The corresponding yield for water is 0.21 ± 0.07.

5651
THEORETICAL RESULTS ON HIGH ENERGY NUCLEAR COLLISONS IN LIGHT AND HEAVY ELEMENTS. H. Messel, R. B. Potts, and C. B. A. McCusker. Phil. Mag. (7) 43, 889-99(1952) Aug.

Cascade theories appropriate to the various schemes of plural production of mesons suggested by Heitler and Janossy (and one by us) are developed. A set of master diffusion equations are set up which contain the various schemes as special cases. Their exact solution is given, and detailed numerical results are presented for one of the schemes. These are presented in a form suitable for direct comparison with those obtained experimentally using photographic-plate techniques. It is suggested, now that the detailed numerical results are available, that a recomparison be made between theory and experimental results previously obtained, in order to see whether the scheme considered does or does not agree with experimental observations. Results are presented in tabular form both for light and heavy elements and for mesons as well as protons. (auth)

5652
PRODUCTION AND INTERACTION OF MESONS AT VERY HIGH ENERGIES. D. Lal, Yash Pal, B. Peters, and M. S. Swami. Phys. Rev. 87, 545(1952) Aug. 1.

Approximately 400 charged and neutral shower particles confined to a narrow cone and produced by a Mg nucleus of 2×10^{14} ev energy provided a source of mesons whose interactions have been studied over an aggregate track length of about 3 m in emulsion. The angular distribution of shower particles is in very close agreement with that predicted for median impact parameter by Fermi's theory (Phys. Rev. 81, 683(1951)), and is not consistent with the assumption that the charged shower particles are produced in pairs by the decay of a very short-lived parent meson slightly heavier than its products. A total of 56 additional charged shower particles were created in ten secondary interactions. Among the conclusions drawn are: the interaction cross section of charged shower particles is equal to the geometric area of the target nucleus; for an incident energy $\gamma_0 \approx 1000\ \mu c^2$, an average of five to six mesons are produced in secondary interactions; and meson-produced meson showers lead to much lower excitation of the target nucleus than nucleon-produced meson showers of comparable multiplicity. The ratio of neutral pions to the created charged shower particles is $n_0/(n_+ + n_-) = 0.86 \pm 0.1$.

5653

REGULAR MESON POTENTIALS IN LOW ENERGY PROTON-PROTON SCATTERING. H. E. Hart and R. D. Hatcher. Phys. Rev. 87, 375(1952) July 15.

Proton-proton scattering up to 3 Mev is investigated theoretically by means of a potential form which is asymptotically equal to the coulomb potential, is finite everywhere, and is derivable from the static approximation of a relativistically invariant meson theory. Agreement is obtained with experimental results for values of parameters corresponding to a meson mass of 274 m_e.

5654

POSSIBILITY OF OBTAINING EXPERIMENTAL INFORMATION CONCERNING THE MESON-MESON INTERACTION. Keith A. Brueckner and Kenneth M. Watson. Phys. Rev. 87, 621-2(1952) Aug. 15.

The observation of correlated pairs of mesons associated with high-energy stars is suggestive of a strong attractive interaction between pairs of π mesons. If such an interaction exists, it should appear in a relatively simple manner in the production of pairs of mesons by protons or γ rays near the energetic threshold. The observation of a marked correlation in energy and angle between the mesons of a pair produced in a single event should lead to quantitative information concerning the meson-meson interaction. (auth)

5655

NARROW ANGLE PAIRS OF PARTICLES FROM NUCLEAR INTERACTIONS. J. J. Lord, Joseph Fainberg, D. M. Haskin, and Marcel Schein. Phys. Rev. 87, 538-9(1952) Aug. 1.

In an investigation of nuclear interactions of π^- mesons in Ilford G5 emulsions, two examples have been found of the emission of a pair of fast particles. In one case the tracks indicate a negative 138 ± 7-Mev pion and a 17 ± 4-Mev proton. A narrow-angle pair of tracks (0.3 ± 0.06° between tracks) were emitted at a angle of 100 ± 2° with respect to the incident pion track. The second nuclear interaction observed is almost identical in appearance except that the angle between the pair is 6.3°. Measurements of ionization and multiple scattering indicate that the particles are probably electron pairs, in which case their total energies would be 201 ± 39 and 205 ± 25 Mev, respectively. The reactions $\pi^- + p \rightarrow n + \gamma$ and $\pi^- + p \rightarrow n + \pi^0$ are considered as possible initial steps in the production of the electron pairs.

METEOROLOGY

5656

THE FORECASTING OF MICROMETEOROLOGICAL VARIABLES. Maynard E. Smith. Meteorol. Monographs 1, No. 4, 50-5(1951) Nov.

An abstract of this material was indexed as AECU-702 and appears in Nuclear Science Abstracts as NSA 4-1781.

NUCLEAR PHYSICS

5657

Nuclear Physics Labs., Columbia Univ.

PROGRESS REPORT FOR JANUARY, FEBRUARY, MARCH 1952. June 6, 1952. 40p. (CU-110)

The slow neutron cross section of Th was determined in the low-energy region as $\sigma = 1.31\ E^{-1/2} + 12.4$. A new level was found in Ba at 380 ev by the (n,γ) reaction. Data on (n,γ) cross section are given for BaF_2 and SrF_2. In the neutron scattering experiments, the range of scattering measurements was extended by increasing the calibration range of σ_s/σ_t from 0.45 to 0.99 by using B-Ni mixtures. Further values for the paramagnetic scattering cross section of MnO, MnF_2, $ZnFe_2O_4$ and $NiFe_2O_4$ were determined from transmission data obtained with the Brookhaven slow chopper. The status of the development of the neutron velocity spectrometer is outlined.

5658

THE ATOMIC NUCLEUS AS A COMPRESSIBLE DROP. I. THE NUCLEUS IN THE GROUND STATE. S. Flügge and K. Woeste. Z. Physik 132, 384-98(1952). (In German)

A refinement of the liquid-drop model of the nucleus is obtained by consideration of the compressibility of the nuclear material and the possibility of mutual displacement of the neutron and proton liquids. It is shown that both proton and neutron densities increase toward the nuclear surface with increasing number of particles. As a consequence for $Z > 36$ a zone that is under tensile stress appears in the interior of the nucleus. Near the upper limit of the periodic system ($Z = 91$) this stress becomes so great that the average hydrostatic pressure in the nucleus vanishes. The nuclear radius, as a result of these phenomena, is not strictly proportional to $A^{1/3}$ as for incompressible nuclei, but increases somewhat more rapidly with increasing A. A series of correction terms are derived for nuclear binding energies.

5659

ARE DIRECT NUCLEON-LEPTON INTERACTIONS CHARGE-INDEPENDENT? Frederik J. Belinfante. Phys. Rev. 87, 521-2(1952) Aug. 1.

If direct nucleon-lepton interactions are charge-independent, the coefficients of $H_{PN\epsilon\nu}$, $H_{NP\nu e}$, $\frac{1}{4}H_{pp_{e\epsilon}}$, $-\frac{1}{4}H_{NNe\epsilon}$, $-\frac{1}{4}H_{pp_{\nu\nu}}$, and $\frac{1}{4}H_{NN\nu\nu}$ in the hamiltonian should be equal, where $H_{[jk]}$ means the space integral of any of the invariants $\Sigma_n \bar{\psi}_j \omega_n \psi_j \bar{\psi}_k \omega^n \psi_l$ and the neutrino ν is assumed to be different from the antineutrino. Phenomenological descriptions of the Lamb shift and the attractive electron-neutron interaction do not satisfy this condition. It is concluded that charge-independence of the phenomenological direct nucleon-lepton interactions is not to be expected.

NUCLEAR PROPERTIES

5660

Wisconsin Univ.

EVIDENCE FOR NON-ADDITIVITY OF NUCLEON MOMENTS IN HEAVY NUCLEI, by Marc Ross. [nd] 32p. (AECU-2193)

An attempt is made to evaluate additional evidence for the non-additivity of nucleon moments and to correlate it

with the evidence provided by the existence of the anomaly in the H^3, He^3 moments. Attention is first given to the deviations of the static moments of heavy nuclei from the Schmidt lines. This is shown to be an unreliable and ambiguous source of information because the moments are so sensitive to deviations from pure shell-model wave functions. Furthermore the observed differences from the Schmidt lines are opposite in sign and much larger in magnitude than would be expected on the basis of H^3 and He^3, so they could only be ascribed to a non-additivity effect if that were a many-body effect. Much more reliable information is shown to be provided by the lifetimes of certain "forbidden" magnetic-dipole transitions in heavy nuclei. These are the radiative processes which seem to involve one-particle transitions with $\Delta l = 2$; hence they are forbidden on the basis of the ordinary additive moment. Here the influence of reasonable deviations from shell-model functions is quite small, so the existence of the transitions is good evidence for a non-additive contribution to the moment operator. Furthermore, the magnitude of the effect is quite compatible with what would be expected on the basis of the H^3, He^3 moment anomaly. (auth)

5661

Rochester Univ.

ANGULAR DISTRIBUTIONS OF PROTONS AND TRITONS FROM DEUTERON INDUCED REACTIONS ON Be^9, by H. W. Fulbright, J. A. Bruner, D. A. Bromley, and L. M. Goldman. July 25, 1952. 11p. (NYO-3219)

The angular distributions and absolute cross sections for the reactions $Be^9(d,p)Be^{10}$, $Be^9(d,p)Be^{10*}$ (3.37 Mev), and $Be^9(d,t)Be^8$ have been determined with 3.6-Mev deuterons. Both proton distributions have shapes characteristic of $l_n = 1$ in the Butler theory. The peak cross sections found for these reactions are 3.1 ± 0.6 and 4.5 ± 0.9 mb/steradian, respectively. The triton distribution is peaked at 0°. Its cross section at 5° is 15.5 ± 3 mb/steradian. (auth)

5662

RAND Corp.

GAMMA-RAY TRANSMISSION THROUGH FINITE SLABS - PART II, by G. H. Peebles. May 2, 1952. 185p. (RM-653 (pt.II) (RAND))

The mono-energetic, mono-angular beam of photons is the fundamental incident distribution in the sense that other incident distributions can be obtained from it by integration. This report checks the transmission with one and two scatterings against the results obtained by means of an idealized case where the total absorption coefficient is a straight line function of the wave length in Compton units. The buildup factors for the fundamental incident distributions are partially checked by calculation of the transmission through a succession of thin slabs. The results for Pb and Fe are also extended to an arbitrary, elemental material. (see AECD-3239, NSA 5-5917, for Part I)

5663

THE QUADRUPOLE MOMENTS OF NUCLEI ACCORDING TO THE SPHEROIDAL NUCLEAR MODEL. R. Van Wageningen and J. De Boer. Physica 18, 369-77(1952) June-July. (In English)

The spheroidal nuclear model of Rainwater (Phys. Rev. 79, 432(1950)) and Feenberg and Hammack (Phys. Rev. 81, 285 (1951)) is adapted to the strong spin-orbit coupling which is characteristic for the Mayer-Jensen nuclear model. The quadrupole moments so obtained change sign at all shells and subshells of the Mayer-Jensen shell model. The quadrupole moments calculated with the present model agree in general with the experimental values for those nuclei consisting of closed shells plus or minus one nucleon. As for some of these nuclei, e.g., K^{39}, Co^{59}, Rb^{87}, La^{139}, Pr^{141}, Sr^{87}, Zr^{91}, and Gd^{157}, experimental data are not yet available; only the theoretical value according to the spheroidal model is given. A discussion is also given of the quadrupole moments of nuclei with more than one nucleon or nucleonhole outside closed shells, but here the theoretical calculation is difficult as this requires the mutual interaction of the nucleons to be taken into account. (auth)

5664

LIFETIME OF AN EXCITED STATE OF Hf^{176}. F. K. McGowan. Phys. Rev. 87, 542(1952) Aug. 1.

An 89-kev excited state in Hf^{176} with $1.35 \pm 0.10 \times 10^{-9}$-sec half life has been observed with a delayed-coincidence scintillation spectrometer and Lu^{176} sources. The K-shell internal-conversion coefficient of the transition was determined to be 1.25 ± 0.15 by comparing the intensities of the 89-kev γ and 55.5-kev x radiation following the β decay of Lu^{176}. The transition is of the E2 type, and the spin of the excited state is 2.

5665

GAMMA-GAMMA ANGULAR CORRELATION IN Cd^{114}. E. D. Klema and F. K. McGowan. Phys. Rev. 87, 524(1952) Aug. 1.

The angular correlation of the γ rays emitted in cascade from the excited states of Cd^{114} has been measured. The data were taken at increments of 10° from 90 to 160°, and each NaI-crystal detector was set on integral at the lower edge of the photo peak due to the 548-kev γ ray. The correlation is given by $W(\theta) = 1 + 0.111P_2(\cos\theta) + 0.023P_4(\cos\theta)$ or $W(\theta) = 1 + 0.084\cos^2\theta + 0.106\cos^4\theta$, in which the angular resolution of the apparatus has been taken into account. The correlation is consistent with a spin assignment of 0-2-2 for the ground state and the two excited states of Cd^{114}, respectively. The first γ ray of the cascade is a mixture of 97% magnetic dipole and 3% electric quadrupole radiation with the electric and magnetic components in phase. The intensity of the crossover γ relative to the main cascade has been found to be about 6%.

5666

THE BINDING ENERGY OF THE α-PARTICLE. John Irving. Phys. Rev. 87, 519-20(1952) Aug. 1.

The nuclear interaction potential consisting of central and tensor forces which has been found to be satisfactory for a description of low-energy scattering processes and in accounting for the properties of the deuteron has been used to calculate the binding energy of the α particle. The standard variation method was employed with a wave function representing a mixture of the principal $^1S_0$ and the principal $^5D_0$ states. The radial wave functions chosen were of an exponential type. For the phenomenological parameters used by Pease and Feshbach (Phys. Rev. 81, 142 (1951)) to yield a reasonable value of the triton binding energy, the calculated binding energy of the α particle is less than the experimental. For nearly equal central and tensor force ranges very little binding energy is obtained for the α particle, so that the result of Hu and Hsu (Proc. Roy. Soc. (London) A204, 476(1951)) for the triton for a particular set of nuclear constants seems incompatible with the α-particle binding energy.

5667

THE INFLUENCE OF CHARGE INDEPENDENCE OF NUCLEAR FORCES ON ELECTROMAGNETIC TRANSITIONS. L. A. Radicati. Phys. Rev. 87, 521(1952) Aug. 1.

In a recent paper Trainor (Phys. Rev. 85, 962(1952)) showed that the symmetry properties of nuclear states give

rise to certain selection rules for electric-dipole radiation. It is pointed out in the present paper that this result is much more general and applies not only to electric-dipole radiation but also to radiation of any multipolarity. Secondly, it is shown that the selection rule obtained is not restricted to the case (considered by Trainor) in which the nuclear forces are pure Wigner- and Majorana-type forces, but holds provided only that the forces are charge-independent.

5668

MAGNETIC SHIELDING EFFECTS IN COMPOUNDS OF VANADIUM. H. E. Walchli and H. W. Morgan. Phys. Rev. 87, 541-2(1952) Aug. 1.

The nuclear magnetic resonance for V^{51} has been observed in the metal powder and several compounds of V. Accurate frequency measurements were made with reference to Na for the $NaVO_3$, $VOCl_3$, and V-metal resonances. Other compounds were measured relative to the V resonance in $VOCl_3$. The following frequency ratios were obtained: $\nu(V^{51})/\nu(V^{51})$ in $NaVO_3/VOCl_3 = 0.999491 \pm 0.000010$; $\nu(V^{50})/\nu(D_2)$ in $(NaVO_3) = 0.649203 \pm 0.000012$; and $\nu(V^{50})/\nu(V^{51})$ in $(VOCl_3) = 0.379076 \pm 0.000017$. The signs of both magnetic moments have been determined to be +.

NUCLEAR REACTORS

5669

Oak Ridge National Lab.

A DETERMINATION OF THE DIFFUSION LENGTH OF THERMAL NEUTRONS IN THE X-10 STANDARD GRAPHITE PILE, by E. D. Klema, R. H. Ritchie and T. Arnette. Issued Aug. 15, 1952. 9p. (ORNL-1340; AECD-3384)

An abstract of this report was indexed as report AECD-3384 and appears in Nuclear Science Abstracts as NSA 6-3844.

NUCLEAR TRANSFORMATION

5670

Rochester Univ.

THE BORN APPROXIMATION THEORY OF d-p AND d-n REACTIONS, by P. B. Daitch and J. B. French. July 9, 1952. 7p. (NYO-3203)

Butler (Proc. Roy. Soc. (London) 208, 559(1951)) has given a theory for d-p and d-n reactions which has had remarkable success in explaining experimental results. The purpose of the present note is to demonstrate that in all its essential features Butler's theory is equivalent to a Born approximation calculation. The case for d-p reactions is developed. It is emphasized that application of the Born approximation in the low-energy region is a very crude procedure.

5671

ANGULAR DISTRIBUTIONS OF THE Be^9 + D NEUTRONS. J. S. Pruitt, S. S. Hanna, and C. D. Swartz. Phys. Rev. 87, 534-5(1952) Aug. 1.

Neutrons from $Be^9(d,n)B^{10}$, B^{10*} were observed at six angles between 15 and 140° by means of recoil-proton tracks in 100-μ Ilford C-2 nuclear plates. By using a standard range-energy curve the ground state Q was calculated to be 4.44 Mev, and excitation energies in B^{10} for the other groups are 0.76, 1.78, 2.22, and 3.68 Mev. Each angular distribution shows some evidence for a forward peak, suggestive of the stripping process. The lowest-energy neutron group ($E_x = 3.68$ Mev) can be fitted remarkably well by a curve calculated from the theory of Butler (Proc. Roy. Soc. (London) A208, 559(1951)) for $l_p = 1$. The other four distributions show an increasing yield in the backward quadrant. A simple $(1-\cos\theta)$ curve added to the $l_p = 1$ stripping curve gives a reasonable fit to most of the data. The parities of the final states are even if Be^9 is odd, and the angular momenta are limited to 0, 1, 2, or 3. The relative neutron weights of the 5 states of B^{10} are tabulated.

5672

THE REACTION $N^{14}(\gamma,2n)N^{12}$. Wolfgang K. H. Panofsky and Daryl Reagan. Phys. Rev. 87, 543(1952) Aug. 1.

The reaction $N^{14}(\gamma,2n)$ has been studied by irradiating samples of melamine in the direct beam of a linear accelerator, 0.04 in. of W being placed ahead of the sample to convert the electron beam. The repetition rate was adjusted to about 10 pulses/sec, and the machine was operated near 120 Mev. A small β spectrometer was used, with two G-M counters in coincidence as detectors. The resultant decay curve agreed well with the half life of 12.5 msec measured by Alvarez (Phys. Rev. 80, 519(1950)). The results of yield measurements give $\int \sigma dE = 5.5 \pm 2 \times 10^{-4}$ Mev-barns.

5673

AN EXPERIMENTAL TEST OF THE SHELL MODEL. W. C. Parkinson, E. H. Beach, and J. S. King. Phys. Rev. 87, 387-8(1952) July 15.

The angular distribution of protons from the reaction $P^{31}(d,p)P^{32}$ has been measured with deuterons of energy 7.20 Mev (center of mass system). The experimental curve is compared with the theoretical curves of Butler (Proc. Roy. Soc. (London) A208, 559(1951)) for $l = 0$ and $l = 2$. The results indicate that the neutron is captured mainly into a D state, as is predicted by the shell model, rather than an S state, with an amount of admixture not exceeding 5% and probably less than 2%.

5674

NEUTRONS FROM DEUTERON BOMBARDMENT OF N^{14}. William B. Rose, Emmett L. Hudspeth, and N. P. Heydenburg. Phys. Rev. 87, 382-3(1952) July 15.

The neutron spectrum from 1.7-Mev deuteron bombardment of N^{14} has been studied by means of nuclear emulsions placed at 0 and 90° to the deuteron beam. Two groups of neutrons were ascribed to $N^{14}(d,n)$, corresponding to Q values of ~5.1 and 0.2 Mev and indicating an excited state in O^{15} at ~4.9 Mev. Other neutron groups which were observed are attributed to (d,n) reactions in C and D.

5675

INELASTIC SCATTERING RESULTING IN SHORT-LIVED ISOMERS. O. Hittmair. Phys. Rev. 87, 375-6(1952) July 15.

The angular distribution of γ radiation following an inelastic-scattering process is calculated in general, and then two simplifications are introduced for the case in which the inelastic-scattering process results in a short-lived isomer with mass >100. One simplification results from making the statistical assumption for the compound nucleus. The coefficients of the Legendre polynomials of the angular distribution are tabulated for neutron scattering by several specific nuclei. It is pointed out that an experimental check of the angular distributions would show how well the statistical model accounts for the given situation, since the spin and parity assignments have been established by other experiments.

5676

RELATIVE YIELDS OF PHOTONUCLEAR REACTIONS. L. S. Edwards and F. A. MacMillan. Phys. Rev. 87, 377 (1952) July 15.

Relative yields for 44 photonuclear reactions have been measured by the method of radioactive end-products. The materials, in the form of thin metal foils or simple compounds in powder form, were irradiated in the x-ray beam from a 70-Mev cyclotron. Relative yields and calculated cross sections are tabulated. A striking feature of these results is that (γ,pn) yields, previously considered to be small, are of the same order as (γ,p) yields; similarly, $(\gamma,2pn)$ yields are of the same order as $(\gamma,2p)$ yields.

5677
ANGULAR CORRELATION IN THE REACTION $B^{11}(p;\gamma_1,\gamma_3)C^{12}$. Thomas P. Hubbard, Jr., Edward B. Nelson, and James A. Jacobs. Phys. Rev. 87, 378(1952) July 15.

Thick targets of natural B were bombarded with 170-kev protons. The angular distribution of the resulting 11.8-Mev γ ray of C^{12} and the angular correlation of the 11.8- and 4.5-Mev γ rays of C^{12} were measured by means of NaI(Tl) crystals and RCA 5819 photomultipliers. The results are consistent with the spin of the 4.5-Mev excited state of C^{12} being 2, the 11.8-Mev γ ray being dipole radiation, and the 4.5-Mev γ ray being quadrupole radiation.

5678
INTERPRETATION OF THE LONG-RANGE PROTONS FROM THE DEUTERON BOMBARDMENT OF Be^9. W. W. True and L. Diesendruck. Phys. Rev. 87, 381-2(1952) July 15.

The experimental curves of angular distribution of long-range protons from $Be^9(d,p)$ at deuteron energies from 1.00 to 2.20 Mev can be fitted by a cosine power series or a series of Legendre polynomials only by employing both even- and odd-power terms and by including the sixth power. The differential cross-section curve is compared with the curve calculated for deuteron stripping. It is concluded that the forward peak observed in the angular distribution even at low energies is due to the stripping reaction and that the remaining curve, which represents a sum of one term referring only to compound-nucleus formation and one due to interference between compound-nucleus formation and stripping, is lowered in complexity and therefore not so severely affected by penetrability difficulties.

5679
ANGULAR DISTRIBUTION OF LONG RANGE PROTONS FROM THE $Be^9(d,p)Be^{10}$ REACTION. D. De Jong and P. M. Endt. Physica 18, 407-14(1952) June-July. (In English)

The angular distribution of long-range protons from the $Be^9(d,p)Be^{10}$ reaction has been measured at a deuteron bombarding energy of 470 kev. The distribution shows a pronounced maximum in backward direction. Series expansion of the distribution into spherical harmonics is shown to be simple, terms containing $P_4(\cos\theta)$ or higher being negligible. A short discussion is given of the theoretical implications of the observed distribution. (auth)

5680
ANGULAR DISTRIBUTIONS OF PROTONS FROM THE $C^{13}(d,p)C^{14}$ AND $C^{12}(d,p)C^{13}$ REACTIONS. B. Koudijs, P. M. Endt, J. M. Van Der Hart, and P. J. W. Palmen. Physica 18, 415-20(1952) June-July. (In English)

Angular distributions have been measured of protons from the ground-state transitions of the reactions $C^{13}(d,p)C^{14}$ and $C^{12}(d,p)C^{13}$ at a deuteron bombarding energy of 470 kev. The target consisted of Ba carbonate enriched to 56% in C^{13} content. The angular distribution of $C^{13}(d,p)C^{14}$ protons shows a pronounced maximum in forward direction and a minimum at 126°. The $C^{12}(d,p)C^{13}$ proton distribution shows minima in forward and backward directions and a maximum at 97°. The ratio of $C^{12}(d,p)C^{13}$ to $C^{13}(d,p)C^{14}$ total cross sections is equal to 8.7. (auth)

5681
ANGULAR DISTRIBUTIONS OF FOUR PROTON GROUPS FROM THE $B^{10}(d,p)B^{11}$ REACTIONS. P. M. Endt, C. H. Paris, H. M. Jongerius, and F. P. G. Valckx. Physica 18, 423-8(1952) June-July. (In English)

Angular distributions have been measured of four proton groups from the $B^{10}(d,p)B^{11}$ reaction corresponding to transitions to the ground state (group 0) and the three lowest excited states of B^{11} (groups 1, 2, and 3). A thin target of natural boron was bombarded with 310-kev deuterons and protons were detected by nuclear emulsions placed at 15° intervals round the target. Protons of different groups were distinguished by their range in the emulsion. Angular distributions of groups 0 and 2 are peaked in the forward direction while those of groups 1 and 3 are more nearly isotropic. By integration over solid angle total cross sections were determined. They amount to 48 μb for group 0, 18 μb for group 1, 76 μb for group 2 and 11 μb for group 3. (auth)

5682
SEARCH FOR BETATRON INDUCED, LOW Z, ACTIVITIES OF SHORT HALF-LIFE. Raymond K. Sheline. Phys. Rev. 87, 557-60(1952) Aug. 15.

B^8 has been observed as a 0.61 ± 0.11-sec positron emitter produced by the following reactions: $B^{10}(\gamma,2n)B^8$, $B^{11}(\gamma,3n)B^8$, and $C^{12}(\gamma,p3n)B^8$. Li^9 has been observed as a 0.19 ± 0.05-sec beta-minus emitter produced by the reaction, $B^{11}(\gamma,2p)Li^9$. Irradiation of elements from Z = 3 to Z = 9 with a 0- to 50-Mev gamma-ray spectrum failed to induce any other short-lived activities. In spite of this, B^{13}, C^9, and O^{13} are not ruled out as short-lived activities. Li^4 is not produced in observable amounts through the reaction $Li^6(\gamma,2n)Li^4$ if it has a half life between 0.1 sec and 1 min; it is probably particle unstable. (auth)

PARTICLE ACCELERATORS

5683
Crocker Lab., Univ. of Calif., Berkeley
THE RADIO-FREQUENCY SYSTEM OF THE 60-INCH CYCLOTRON AT BERKELEY, by Kenneth E. Relf. 1950. 240p. (BP-42(3rd Ed.))

This report is primarily designed as a text on accelerator engineering for engineering students. A detailed description is given of the r-f systems of the 60-in. Berkeley cyclotron. The various phases of the r-f systems described include the following: the oscillator tube and circuit; electrical behavior of the dee circuits, characteristic curves of the oscillator tube; coupling the oscillator to the cyclotron; putting the main oscillator into operation; the metering circuits; the main-oscillator rectifier; measurement and calibration procedures; transmission line theory; and the booster oscillator.

5684
NOTE ON THE DEVELOPMENT OF A 800 KV ACCELERATION TUBE. P. C. Veenstra, H. M. Jongerius, C. H. Paris, and F. P. G. Valckx. Physica 18, 378-86(1952) June-July. (In English)

A description is given of the present acceleration tube and ion-source in use with the Utrecht 800-kv cascade generator. The ion source is of the magnetic type operating with cold emission ensuring reliability and low power consumption. The importance is stressed of good focusing, and experiments are described to meet this requirement. (auth)

RADIATION ABSORPTION AND SCATTERING

5685
National Bureau of Standards
X RAY ATTENUATION COEFFICIENTS FROM 10 KEV TO 100 MEV, by Gladys R. White. May 13, 1952. 104p. (NBS-1003; U22744)

Existing theories on narrow-beam attenuation coefficients of x and γ rays are surveyed. The coefficients for 19 elements over the 0.01- to 100-Mev photon energy range are tabulated with separate columns for contributions from coherent and incoherent scattering, pair production, and photoelectric effects in the K, L, and M shells. The cross sections for the photoelectric effect in the K shell were calculated by the Stobbe-Sauter combined formula at low energies, by interpolation from the Hulme calculations at moderately high energies, and from the Hall formula at very high ener-

gies, and are estimated to possess accuracies of 3 and 10% where the effect is predominant and insignificant, respectively. Tables are included of the mass absorption coefficients of NaI, air, water, and concrete and of the total Compton cross section calculated from the Klein-Nishina formula. An appendix compares calculated attenuation coefficients with those obtained by several experimenters. (NRS abst.)

5686
Rochester Univ.
INTERFERENCE BETWEEN COULOMB AND NUCLEAR SCATTERING IN p-p COLLISIONS AT 240 MEV, by H. P. Noyes and H. G. Camnitz. July 17, 1952. 6p. (NYO-3218)

Calculations taking into account coulomb-nuclear interference have been performed on the angular distribution in high-energy p-p scattering. It was hoped that the coulomb-nuclear interference might improve the predictions of the singular tensor potential of Christian and Noyes (Phys. Rev. 79, 85(1950)) and/or alter qualitatively the predictions of the hard-core Jastrow model (Phys. Rev. 81, 165(1951)). The singlet phase shifts for these two cases are tabulated. The resulting angular distributions including coulomb scattering and coulomb-nuclear interference are plotted in comparison with Towler's data (Phys. Rev. 84, 1262L(1951)) and show that the coulomb effects are insufficient to remove the forward peak predicted by the Christian-Noyes potential. The Jastrow model, while not in quantitative agreement with Towler's data, could presumably be brought into agreement by a readjustment of the parameters. However, it became apparent that the Jastrow model could be extremely sensitive to kinematic relativistic effects that have previously been ignored. Consequently it would seem pointless to make any refinements on the Jastrow parameters without also attempting a correct relativistic treatment of the problem, including dynamic as well as kinematic effects.

5687
THE PAIR-PRODUCTION CROSS SECTION FOR HIGH ENERGIES. P. A. Fraser. Phys. Rev. 87, 523(1952) Aug. 1.

The total cross section for pair production in the field of an atom of atomic number Z, for high proton energies, has been calculated by using the Hartree atomic model. Calculations were made for Hg, the largest Z which has been treated by the Hartree method. The cross section obtained agreed within ½% with that calculated by using the Thomas-Fermi atom. The form factors differed for small q by as much as 5%, but mainly in a small region, $0<q<0.1$. Even within this region, the difference alternated in sign and was largely canceled in the integral.

5688
THE SINGLE ELASTIC SCATTERING OF POSITRONS BY NITROGEN NUCLEI. R. R. Roy and L. Groven. Phys. Rev. 87, 619-21(1952) Aug. 15.

The nuclear scattering of positrons from Rh^{102} by N was investigated by the cloud-chamber method. The number of photographs taken was about 5000, yielding 5212 positrons of energy between 0.53 and 0.98 Mev with a total track length of 712 meters. The number of cases of scattering observed in the angular range 15 to 85° is compared with the theoretical predictions of Rutherford and of Massey. The results favor the assumption of Massey that the scattering of positrons takes place on the interaction of the Dirac particle of positive charge with the field of the nucleus.

5689
GAMMA-RAY ABSORPTION MEASUREMENTS. Stirling A. Colgate. Phys. Rev. 87, 592-601(1952) Aug. 15.

Gamma-ray absorption measurements have been made using a NaI energy-selective scintillation counter with radioactive-source gamma rays of 0.411, 0.664, 1.33, and 2.62 Mev energy. A range of absorbers from hydrogen to uranium was used. The final absorption coefficient was determined to ±0.2 percent root-mean-square statistical accuracy. Additional absorption measurements were made with nuclear-reaction gamma rays at the energies 4.47 6.13, and 17.6 Mev with the same absorbers. A statistical accuracy of ±2 percent was attained. A comparison of theory and experiment is presented and no radical differences are observed. (auth)

5690
THE VALIDITY OF BORN EXPANSIONS. Walter Kohn. Phys. Rev. 87, 539-40(1952) Aug. 1.

Recently the nature of the Born expansions for the case of a nonrelativistic particle scattered by a static potential has been clarified by Jost and Pais (Phys. Rev. 82, 840 (1951)). The present paper supplements this work by establishing, for central potentials, estimates for the radii of convergence for various energy ranges and any angular momentum.

5691
THE EVALUATION OF SOME NEUTRON-ELECTRON SCATTERING EXPERIMENTS. Otto Halpern and C. P. Hsu. Phys. Rev. 87, 519(1952) Aug. 1.

The experiments of Fermi and Marshall on the spin-independent interaction between neutrons and electrons were based on the comparison of the differential scattering cross sections for the angles ϕ and $\pi - \phi$. The present authors have confirmed the expressions given without proof by Fermi and Marshall (Phys. Rev. 72, 1139(1947) for the ratio of the cross sections, for the case in which the velocity distribution of incident neutrons is given by $f(v) \approx v^3 \exp(-mv^2/2kT)$. It is pointed out, however, that this distribution law has not been established theoretically for neutron beams and that any unrealistic assumption concerning the number of slow neutrons would affect the total neutron-electron effect considerably. To avoid the difficulty one could either use a thick detector whose response is independent of the velocity distribution, or one would have to determine experimentally the actual number of slow neutrons present.

5692
SOME DATA ON THE ELASTIC SCATTERING OF 18.3-MEV PROTONS. P. C. Gugelot. Phys. Rev. 87, 525-6(1952) Aug. 1.

Measurements have been made of the absolute differential cross sections for elastic scattering of 18.3 ± 0.1-Mev protons by Al, Fe, Ni, Cu, Ag, Sn, and Pt. For Al and Pt measurements were also carried out with the energy of the protons reduced to 15.5 ± 0.2 Mev. The results are tabulated, and some are presented graphically for comparison with the calculations of Le Levier and Saxon (Phys. Rev. 87, 40(1952)) and the measurements of Burkig and Wright (Phys. Rev. 82, 451(1951)). The following results can be deduced from these measurements; the back-scattering cross sections seem to be little dependent on the size of the scattering nucleus, their values being of the order of 3 mb/sterad for 18-Mev protons; and the back-scattering cross section appears to be inversely proportional to the third power of the proton energy.

5693
SMALL ANGLE COHERENT SCATTERING OF GAMMAS BY BOUND ELECTRONS. J. S. Levinger. Phys. Rev. 87, 656-62(1952) Aug. 15.

Franz has shown that for nonrelativistic changes of photon momentum (q) the coherent scattering of gammas by bound electron reduces to the form-factor calculation. The near-relativistic region is considered by an expansion in q/mc. The corrections to the form-factor calculation are very

small for small atomic numbers, the order of magnitude being (Z/137)(q/mc). Numerical results for scattering by K electrons of tin give an increase of the amplitude of 25 percent above the form-factor value for q/mc = 1.5 and a smaller change for smaller values of q. Results are incomplete since the effects of binding in the intermediate state are neglected. (auth)

RADIATION EFFECTS

5694
Brookhaven National Lab.
RADIATION EFFECTS IN SOLIDS, by G. J. Dienes. Apr. 1, 1952. 62p. (AECU-2196)

In the first part of the paper a brief general survey of the work done in the field of radiation effects on materials since 1928 is presented. In the second part a detailed discussion of the unclassified work in this field since 1949 is presented. The particular classes of solids studied are metals, semiconductors, insulators, and molecular compounds. A bibliography consisting of 113 references is given. (This report is to be published as a chapter in Vol. II of Annual Reviews of Nuclear Science.)

RADIOACTIVITY

5695
Knolls Atomic Power Lab.
MEASURING LOW-LEVEL RADIOACTIVITY, by David L. Douglas. [nd] 20p. (AECU-2141)

Problems involved in measuring extremely low levels of radioactivity are reviewed. The difficulties encountered, and also the potentialities of the technique, are illustrated by a discussion of methods used by Professor W. F. Libby of the University of Chicago, in determination of the age of archeological and anthropological relics by measuring the extremely small amount of radioactive C^{14} contained in the organic C. Problems of instrumentation, shielding against background during counting, and chemical treatment to assure radiochemical purity of C or CO_2 samples for counting are discussed.

5696
Argonne National Lab.
AVERAGE CHARGE OF DAUGHTER ATOMS AFTER β-DECAY, by Sol Wexler. July 1952. 20p. (AECU-2172; UAC-595)

A measurement of the average charge on He^3, N^{14}, and Rb and Cs atoms following β emission by tritium, C^{14} (as CO_2), and a mixture of Kr and Xe fission gases, respectively, is described. The positive ion current of the charged daughter atoms was observed in gases of the parent at very low pressure. The number of electron units of charge collected by a probe in unit time is compared with the disintegration rate of the parent. The average charge per disintegration was approximately one in all three cases, indicating that orbital-electron loss accompanying β^- decay is negligible.

5697
Argonne National Lab.
AVERAGE CHARGE OF Br^{80} ATOMS FROM ISOMERIC TRANSITION, by Sol Wexler. July 1952. 9p. (AECU-2173; UAC-596)

The average charge of 18-min Br^{80} atoms after isomeric transition of the 4.4-hr parent has been measured. The positive ion current generated by the daughter atoms from the decay of gaseous $C_2H_5Br^{80m}$ at low pressure was compared with the disintegration rate of Br^{80m}. The experimental procedures are described. The average charge per disintegration was measured as 10 electron units, the individual runs varying from 8 to 13 electron units. The results of a rough calculation of the expected charge distribution also are tabulated for comparison; the average predicted charge is 6.8 electron units.

5698
Atomic Energy Research Establishment, Harwell, Berks (England)
THE INVESTIGATION OF SOFT RADIATIONS FROM Pu^{239} AND U^{233} WITH A PROPORTIONAL COUNTER, by D. West, J. K. Dawson, and C. J. Mandleberg. Apr. 28, 1952. 20p. (AERE-N/R-902)

Soft electromagnetic radiations from Pu^{239} and U^{233} have been investigated with a proportional counter filled with krypton or xenon. Pu^{239} emits the L x radiation of uranium with an intensity of $4 \pm 1 \times 10^{-2}$ L x rays per α particle. The L x radiation arises as a result of the internal conversion of γ rays. Residual unconverted gamma rays with energies of 52.0 ± 0.3 and 38.5 ± 0.4 kev are emitted. The intensities of these gamma rays are 7×10^{-5} and 2×10^{-5} quanta per α particle, respectively. K x rays are emitted with an intensity of about 2×10^{-5} quanta per α particle. A gamma radiation of energy equal to 45 ± 0.3 kev is ascribed to Pu^{238} or Pu^{240}. U^{233} emits the L x radiation of thorium with an intensity of $4 \pm 1 \times 10^{-2}$ L rays per α particle. Gamma radiations of energies 42.8 ± 0.3 and 56.1 ± 0.4 kev are present with intensities of 5×10^{-4} and 10^{-4} quanta per α particle, respectively. (auth)

5699
THE DIRECTIONAL CORRELATION OF THE Ni^{60} $\gamma - \gamma$ CASCADE. H. Aeppli, H. Frauenfelder, E. Heer, and R. Rüetschi. Phys. Rev. 87, 379-80(1952) July 15.

Remeasurement of the Ni^{60} $\gamma - \gamma$ directional correlation has yielded a value $A = 0.148 \pm 0.002$ for the anisotropy. An attempt is made to explain the discrepancy between this value and the theoretical value $A = 0.167$ for the cascade 4(E2)2(E2)0. Assumption of other spin and polarity assignments and γ multipolarities does not seem compatible with all the known facts. The influence of the electron shell on the directional correlation was studied by applying an external magnetic field; the correlation was unchanged for field strengths up to 8000 gauss. This indicates that the lifetime of the first-excited state of Ni^{60} is $\sim 10^{-11}$ sec. From the present experiments it is impossible to decide if the discrepancy between theoretical and experimental anisotropy is caused by the influence of the electron shell or if other effects have to be considered.

5700
SPECTRUM OF THE INTERNAL CONVERSION ELECTRONS EMITTED IN THE RADIOTHORIUM → THORIUM X TRANSMUTATION. Salomon Rosenblum, Manuel Valadares, and Marcel Guillot. Compt. rend. 235, 238-40(1952) July 21. (In French)

Reexamination with a β spectrograph of the conversion spectrum of ThX* (Ra^{224*}), produced by emission of the α_1 group of RdTh (Th^{228}), showed the following lines, assignments of which also are listed.

Lines	Hρ, gauss-cm	E, kev	Intensity	Assignment
A	892	65.8	100	L_{II}
B	914	68.9	84	L_{III}
C	988	79.7	29	M_{II}
C_1	993	80.4	23	M_{III}
D	1012	83.3	13	N_{II}
D_1	1018	84.0	2	O

It is concluded that ThX has a single excited state of 84.3-kev energy and spin 2.

5701
ELECTRON CAPTURE IN Tl^{204}. Allan C. G. Mitchell and Robert S. Caird. Phys. Rev. 87, 388-9(1952) July 15.

A series of investigations of the photons from Tl^{204} have been performed. The spectrum of photoelectrons ejected from Pb and U by radiation from Tl^{204} indicated an energy

of 72.0 ± 0.9 kev for the radiation. By comparison with the x rays in the decay of Os^{185} (K_α of Re), the energy was found to be 68 kev. The photon radiations from Tl^{204} were also found to exhibit a maximum counting rate at exactly the same energy as those of Tl^{200}. It is concluded that the photons from Tl^{204} are the K_α x rays of Hg and that Tl^{204} decays to Hg^{204} by K-electron capture.

5702
THE EVALUATION OF THE RATIO F_n/F_0 IN THE THEORY OF FORBIDDEN BETA-TRANSITIONS. P. Macklin, L. Lidofsky, and C. S. Wu. Phys. Rev. 87, 391(1952) July 15.

The tables of the Fermi function issued by the National Bureau of Standards are essentially tables of the Γ function of complex argument, the real part of which is ~1. Therefore, these tables may be utilized for the accurate computation of those correction factors corresponding to the various matrix elements in β decay which contain the ratio of complex Γ functions. To illustrate the use of the tables, the evaluation of the ratio F_n/F_0 is carried out.

5703
THE RADIATIONS OF Tl^{204}. L. Lidofsky, P. Macklin, and C. S. Wu. Phys. Rev. 87, 391-2(1952) July 15.

The β spectrum of Tl^{204} has been investigated with a solenoid spectrometer. The Kurie plot using an exact evaluation of the B_{ij} correction factor is linear from the end-point of 765 kev to ~150 kev. The spectra from chemically deposited and vacuum-evaporated sources of nearly the same strength were compared. The spectrum from the chemical source showed deviation below 350 kev. Absorption measurements of the γ radiations from Tl^{204} indicated that they are Hg x rays accompanying K capture. The abundance of K capture was determined as $N_K/N_{\beta^-} = \sim 2$ to 3%.

5704
SOME OBSERVATIONS ON THE GAMMA-RADIATION FROM POLONIUM. R. W. Pringle, H. W. Taylor, and S. Standil. Phys. Rev. 87, 384-5(1952) July 15.

A coincidence scintillation spectrometer and a weak source of Po in solution have been used to study the γ radiation from Po^{210}. The energy of the hard component was found to be 804 ± 5 kev. No evidence was found for any other γ emission in the range 100 kev to 2 Mev. The average energy of the soft component was measured as 77 ± 2 kev. Less than 1% of the soft radiation is in coincidence with the hard component. If the internal-conversion coefficient for the 804-kev γ is ~5% and the soft component is K x radiation, most of the K-shell ionization is due to processes other than internal conversion.

5705
THE LOWEST EXCITATION LEVEL OF Hg^{198}. P. Staehelin. Phys. Rev. 87, 374-5(1952) July 15.

An electron-electron coincidence spectrometer has been used to investigate the decay of 5.6-day Au^{198}. No conversion lines of a 175-kev transition were detected, but L and M conversion electrons of a new 426 ± 2-kev transition were observed. It is concluded that this transition is in Hg^{198}, following Au^{198} β decay with an energy limit of 270 ± 20 kev. The conversion coefficients for the 426-kev transition are consistent with electric quadrupole radiation.

5706
β^- SPECTRA OF Y^{90}, Y^{91}, Pr^{142}, AND Rb^{86}. Jean Moreau and Jean Perez y Jorba. Compt. rend. 235, 38-40(1952) July 7. (In French)

The maximum energies of the simple β spectra of 61-hr Y^{90} and 60-day Y^{91} were determined to be 2.270 ± 0.020 and 1.564 ± 0.010 Mev, respectively. The maxima of the highest-energy components of the complex spectra of 19-hr Pr^{142} and 19.5-day Rb^{86} were found to be 2.140 ± 0.010 and 1.785 ± 0.005 Mev, respectively.

5707
ARTIFICIAL RADIOACTIVE PRODUCTS EXISTING IN THE ATMOSPHERE IN THE REGION OF PARIS. Marcel Abribat, Jacques Pouradier, and Anne-Marie Venet. Compt. rend. 235, 157-9(1952) July 16. (In French)

A histogram of β activity measured near Paris, France, from Dec. 1951 to June 1952 by evaporating rain water and by filtering large volumes of air is presented. In all cases the β activity decayed by a −1.2 ± 0.1-power law, proving that the radioactive products originated from the Nevada, U. S., atomic bomb explosions.

THEORETICAL PHYSICS

5708
THE MASS OF A PHOTON. L. S. Kothari. Phys. Rev. 87, 536-7(1952) Aug. 1.

The method, developed by Riesz, of solving the hyperbolic equation by the analytical continuation of an integral which is an analytic function of an arbitrary parameter α has been applied to different problems in electrodynamics by various authors. Auluck and Kothari (Proc. Cambridge Phil. Soc. 47, 436(1951)) used a modified definition for the Riesz potential and have shown that it is a generalization of the Wentzel potential in the α-plane. The purpose of the present note is to show that in any problem the use of the modified definition of Auluck and Kothari is equivalent to assuming a finite rest mass for the photon and finally letting it tend to zero.

5709
BOUND STATES AND THE INTERACTION REPRESENTATION. S. T. Ma. Phys. Rev. 87, 652-5(1952) Aug. 15.

The temporal development of the state vectors in the interaction representation is investigated for a quantum-mechanical system that has bound states. It is shown that there is a non-unitary operator which determines the variation of the state vectors of the free states. This operator satisfies the same differential equation and initial condition as the unitary operator which transforms a state vector at the remote past to the state vector at a finite time or in the remote future. No iteration process is made use of in the general investigation. Born's method of successive approximations is discussed. (auth)

TRITIUM AND TRITIUM COMPOUNDS

5710
Los Alamos Scientific Lab.
THE TRIPLE POINT TEMPERATURE OF TRITIUM OXIDE, by W. M. Jones. [nd] Decl. Aug. 19, 1952. 8p. (AECD-3432; LADC-1211)

Tritium gas (0.51% H_2) was oxidized to T_2O by CuO. Immediately after preparation three triple-point temperature determinations were made, yielding 4.491, 4.491, and 4.495°C. A temperature-time curve in the region of interest is shown for the third run. The apparatus for triple-point temperature determination is described.

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 12B, page "SUPPLEMENT 1".

$_{18}A^{37}_{19}$	K Continuous γ spectrum E_γ (max) ~0.75	C. E. Anderson et al., Phys. Rev. 87, 195A(1952); 87, 668(1952).
$_{18}A^{39}_{21}$	β^- >0.35* No $\beta\gamma$* No 2.7^m activity	C. E. Anderson et al., Phys. Rev. 87, 195A(1952); *verbal report. A^{38}(3.8-Mev d,p).
$_{23}V^{48}_{25}$	γ ~4% 2.22 scin Crossover γ <0.5%	H. K. Ticho et al., Phys. Rev. 86, 422 (1952); 87, 195A (1952). Ti(p,n); chem.
$_{25}Mn^{55}_{30}$	I ½ Mic	A. Javan, A. V. Grosse, Phys. Rev. 87, 227A(1952).
Fe	σ_s incoh 0.42	H. Palevsky et al., Phys. Rev. 87, 221A(1952).
$_{27}Co^{58}_{31}$ 9.3^h	τ_1 9.0^h γ 0.026 a,ce$^-$ Co x rays	C. J. Avery et al., Phys. Rev. 87, 216A(1952). Fe^{58}(6.3-Mev p,n).
72^d	Fe x rays	C. J. Avery et al., Phys. Rev. 87, 216A(1952). Fe^{58}(6.3-Mev p,n).
$_{27}Co^{60}_{33}$	Level Co^{59}(d,p) 0.46* a	D. C. Hoesterey, Phys. Rev. 87, 216A(1952); *verbal report.
$_{28}Ni^{61}_{33}$	Level Ni^{60}(d,p) 0.61* a	D. C. Hoesterey, Phys. Rev. 87, 216A(1952); *verbal report.
$_{29}Cu^{64}_{35}$	Levels Cu^{63}(d,p) 0.51 a 0.84* 1.29	D. C. Hoesterey, Phys. Rev. 87, 216A(1952); *verbal report.
As	Resonances E_0 46 ev ~95 ?	S. P. Harris, L. M. Bollinger, Phys. Rev. 87, 222A (1952).
$_{33}As^{70}_{37}$	52^m activity not produced by Ge^{70}(6.3-Mev p,n)	C. J. Avery et al., Phys. Rev. 87, 216A(1952).
$_{33}As^{76}_{43}$	$\beta\gamma(\theta)$ b = 0.04 – 0.07	S. L. Ridgway, F. M. Pipkin, Phys. Rev. 87, 202A(1952).
Rb	Resonances E_0(ev) Isotope 600 87 970 85	R. H. Rohrer, Phys. Rev. 87, 177A (1952).
$_{38}Sr^{87}_{49}$ 2.8^h	γ 0.388 s$\pi\sqrt{2}$ K/L + M = 5.5	W. L. Bendel et al., Phys. Rev. 87, 195A(1952). Sr(γ,n).
Y	Resonance E_0 ~5000 ev	R. H. Rohrer, Phys. Rev. 87, 177A (1952).
$_{39}Y^{89}_{50}$ 13^s	γ (0.913) s$\pi\sqrt{2}$ K/L + M = 7.0	W. L. Bendel et al., Phys. Rev. 87, 195A(1952).
$_{40}Zr^{89}_{49}$ 4.5^m	γ (0.588) s$\pi\sqrt{2}$ K/L + M = 5.4	W. L. Bendel et al., Phys. Rev. 87, 195A(1952). Zr(γ,n).
	β^+ 0.85 a γ ~7%* 1.53 scin (β^+)(>0.6γ)	F. J. Shore et al., Phys. Rev. 87, 202A(1952). Zr(γ,n). *Relative to 0.588.
$_{40}Zr^{96}_{56}$	$\tau_{\beta\beta}$ >10^{17}y*	J. A. McCarthy, Phys. Rev. 87, 194A(1952); *verbal report.
$_{46}Pd^{111}_{65}$ 5.5^h	τ 5.5^h I.T. 75% β^- 25% γ 0.16 scin 1.77 p 7.5^{d}Ag	C. L. McGinnis, Phys. Rev. 87, 202A(1952); priv. comm. Pd(20-Mev d); chem.
26^m	τ 22^m β^- 60% 2.15 sl γ 0.38 scin 0.56 0.65 0.73	C. L. McGinnis, Phys. Rev. 87, 202A(1952); priv. comm. Pd(20-Mev d); chem.

$_{48}Cd^{114}_{66}$	Capture γ's 0.100 0.578	$Cd^{113}(n,\gamma)$ sπ;ce$^-$	C. T. Hibdon, C. O. Muehlhause, Phys. Rev. 87, 222A (1952).
$_{48}Cd^{115}_{67}$ 43^d	β^- <1% 0.33 ~2% 0.65 ~98% 1.61 γ 0.46 0.50 0.96 1.28 (0.46γ)(0.50γ)	sl scin	R. W. Hayward, Phys. Rev. 87, 202A(1952); priv. comm.
2.3^d	β^- ~40% 0.59 ~60% 1.11 γ 0.335 0.360 0.500 0.525 (0.36γ)(0.50γ)	sl scin	R. W. Hayward, Phys. Rev. 87, 202A(1952); priv. comm.
$_{49}In^{111}_{62}$	$\gamma\gamma(\theta)$ b = −0.19		J. C. Kluyver, M. Deutsch, Phys. Rev. 87, 203A (1952).
$_{50}Sn^{124}_{74}$	$\tau_{\beta\beta}$ >10^{17}y*		J. A. McCarthy, Phys. Rev. 87, 194A(1952); *verbal report.
$_{50}Sn^{125}_{75}$ 10^d	β^- 15%* ~0.5 ~2.3 γ 1.67 (~0.5β^-)(1.67γ)	a$\beta\gamma$ a a coin	R. I. Mendenhall et al., Phys. Rev. 87, 203A(1952); *verbal report. Sn^{124}(pile n); chem.
$_{51}Sb^{122}_{71}$ 2.8^d	β^- 4.5% 0.73 69% 1.36 26% 1.94 $\Delta I = 2$, yes γ 73% 0.563 α_K = 0.0052 E2 3.5% 0.692 0.8% 1.25 $\gamma\gamma(\theta)$ I = 2,2,0		M. J. Glaubman, F. R. Metzger, Phys. Rev. 87, 203A(1952); verbal report.
Cs	Resonances E_0 ~10, ~300 ev		R. H. Rohrer, Phys. Rev. 87, 177A (1952).
$_{55}Cs^{131}_{76}$	No γ x ray	scin	W. L. Stirling, M. Goodrich, Phys. Rev. 87, 176A (1952).
$_{55}Cs^{137}_{82}$	γ (0.661) α_K = 0.095 ± 0.005 scin		R. L. Heath, P. R. Bell, Phys. Rev. 87, 176A(1952).
	(0.661) K : L : M + N = 5.5 : 1 : 0.27	s$\pi\sqrt{2}$	W. L. Bendel et al., Phys. Rev. 87, 195A(1952).
La	Resonance E_0 76 ev		R. H. Rohrer, Phys. Rev. 87, 177A (1952).
$_{57}La^{139}_{82}$	σ_S coh 8.7		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
Ce	σ_S coh 2.7		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
$_{58}Ce^{140}_{82}$	σ_S coh 2.8		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
$_{58}Ce^{141}_{84}$	σ_S coh 2.6		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
Pr	Resonance E_0 380 ev		R. H. Rohrer, Phys. Rev. 87, 177A (1952).
$_{59}Pr^{141}_{82}$	σ_S coh 2.4		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
Nd	σ_S coh 6.5		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
$_{60}Nd^{142}_{82}$	σ_S coh 7.5		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
$_{60}Nd^{144}_{84}$	σ_S coh 1.0		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
$_{60}Nd^{145}_{85}$	σ_S coh 9.5		W. C. Koehler, E. O. Wollan, Phys. Rev. 87, 238A(1952).
$_{62}Sm^{150}_{88}$	Capture γ's 0.347 0.453	$Sm^{149}(n,\gamma)$ sπ;ce$^-$	C. T. Hibdon, C. O. Muehlhause, Phys. Rev. 87, 222A (1952).
$_{66}Dy^{161}_{95}$	Capture γ's 0.085 0.108 0.194	$Dy^{164}(n,\gamma)$ sπ;ce$^-$	C. T. Hibdon, C. O. Muehlhause, Phys. Rev. 87, 222A (1952); ANL-4746 (1951).
$_{68}Er^{165}_{97}$	9.9 ± 0.1^h Ho K,L x rays* No e$^-$, no γ*		D. N. Kundu et al., Phys. Rev. 87, 203A(1952); *verbal report. Ho(7.4 Mev p); Ho(10 Mev d).
Hf	Resonances E_0(ev) 1.1 Isotope 177 2.3 177 5.7 179,177? 6.4 177 7.6 178 w 8.7 177 w 14 * 177		S. P. Harris, L. M. Bollinger, Phys. Rev. 87, 222A (1952); *verbal report.

$_{73}Ta^{181}_{108}$	q +5.9 s	B. M. Brown, Phys. Rev. 87, 228A (1952).
$_{77}Ir^{194}_{117}$	β^- 0.3%* (0.48) $\gamma\gamma(\theta)$ indicates 2,1,0 or 2,2,0	C. E. Whittle, P. S. Jastram, Phys. Rev. 87, 203A (1952); *verbal report.
$_{79}Au^{198}_{119}$	No K capture	C. D. Broyles, S. K. Haynes, Phys. Rev. 87, 174A(1952).
$_{80}Hg^{200}_{120}$	Capture γ $Hg^{199}(n,\gamma)$ ~0.29 sγ;ce$^-$	C. T. Hibdon, C. O. Muehlhause, Phys. Rev. 87, 222A (1952).
Tl	Resonances E_0(ev) Isotope (270) 203 (1,300) 203 10,000 205	R. H. Rohrer, Phys. Rev. 87, 177A (1952).
$_{81}Tl^{204}_{123}$	β 0.765 s $\Delta I = 2$, yes shape Hg x ray crit a X/β^- 0.02 No γ	L. Lidofsky et al., Phys. Rev. 87, 204A(1952); 87, 391(1952).
$_{91}Th^{228}_{138}$	γ 0.0843 s,ce$^-$ L_{II}/L_{III} = 1.19 E2 All ce$^-$ lines shown due to one γ, not two	S. Rosenblum et al., Compt. rend. 235, 238(1952).
$_{95}Am^{242}_{147}$ 16^h	τ 16.01 ± 0.02^h	T. K. Keenan et al., Phys. Rev. 87, 204A(1952).